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CYCLOPÆDIA
OF
OBSTETRICS AND GYNECOLOGY
VOLUME TEN

DISEASES
OF THE
Female Urethra and Bladder

BY

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AND

DISEASES OF THE VAGINA

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WITH NINETY-NINE FINE WOOD ENGRAVINGS.

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DISEASES

OF THE

Female Urethra and Bladder.

BY

F. WINCKEL, M.D.

DISEASES

OF THE

FEMALE URETHRA AND BLADDER.

CHAPTER I.

HISTORICAL RETROSPECT.

THE history of our knowledge of the diseases of the female urethra and bladder shows us that, as in so many other branches of human knowledge, there were methods of exploration and treatment known to physicians hundreds and thousands of years ago, which in the course of time were entirely forgotten, to be rediscovered by succeeding generations. Obstetrics and gynecology suffered perhaps more than any other specialties in this respect, and our knowledge of diseases of the urinary apparatus, which was fairly well developed in remote times, shared their lot. Thus for instance, the Cnidian school possessed a fairly accurate knowledge of bladder derangements; they described both acute cystitis and chronic catarrh with ammoniacal decomposition of the urine; and they were aware of the fact that calculi were of less common occurrence in females on account of the short size and the large calibre of their urethræ. They did indeed consider a wound of the bladder as necessarily fatal; but they are said to have practised nephrectomy. The ancient Indians (*circa* 1000 B.C.), were aware of the occurrence of lithiasis, and practised the urethral or vagino-cystic incision for the extraction of the stone. Erasistratos (304 B.C.), is said to have been the first to employ the catheter; and Soranos (100-150 A.D.), recommended the use of the instrument to increase the efficiency of the expulsive pains. The Talmudists endeavored to cure cystic concretions by solvent injections into the bladder; and Celsus (25-50 A.D.), mentions the frequency of ischuria in the female and the spontaneous evacuation of calculi. Aetius (502-575 A.D.) described ulcerative affections of the internal surface of the bladder, and Paul of Aegina (670) treated various cystic troubles by means of injections through the catheter. Local therapy of the bladder, therefore, is of ancient date.

In view of all this, it is remarkable that many easily recognized anomalies of the organ, such as urethral tumors and vesico-vaginal fistulæ, were entirely unknown until the end of the Middle Ages. It is easy, however, to understand why. The study of diseases of the female urethra and bladder suffered from the same unfavorable circumstances that the practice of obstetrics did. For although the practice of accouchement by men was common among the Indians, neither the Greeks nor the Arabs deemed it worthy of their care. Hippocrates causes the young physician to swear never to cut for stone himself, but to leave this not very honorable operation to the surgeons. This contempt for certain surgical operations has survived until recent times; and hence the organs in question were left to the care of midwives or untutored "stone-cutters," who could contribute but little to a scientific knowledge of their abnormalities. "Physicians even of the 16th century did not hesitate to practice uroscopy daily; but they were ashamed to display any surgical or obstetrical ability."[1] Another cause is to be found in the prolonged influence of Arabian medicine (600-1600 A.D.), which was undoubtedly unfavorable; since it is well known that the Arabs regarded even the thought of *post-mortem* examination as sinful, and the practice of obstetrics and gynecology by men was forbidden by their religion. And if they were compelled to treat maladies of this class, midwives made their examinations and conducted their treatment. Thus Kurt Sprengel declares[2] that Abulkasem was the first to declare the necessity of cutting for stone in women. He thinks the midwife necessary, since no surgeon would dare to offend female modesty by operating himself. But even when in the 17th century, the practice of obstetrics by men became the fashion in Paris, and spread thence over Europe, an ocular examination of the female genitals was interfered with in every possible way, even to the extent of fastening a sheet around the necks of the lying-in woman and the accoucheur, so that her modesty should not be offended by his gaze. The author himself has lately had occasion to observe how long such prejudices survive, when examining a young American woman; it being suggested to him to introduce the speculum through a small hole in a sheet spread over the patient.

But in spite of all these difficulties, by the end of the Middle Ages much progress had been made in the study of the maladies we are considering. Benevieni (1502) of Florence had dilated the female urethra to extract a stone. Rembert Dodoius of Mechlin had demonstrated *post-mortem* the existence of sclerosis of the kidney, enlargement of the cali-

---

Baas, Grundriss der Geschichte der Medicin, p. 367.

[2] Versuch, etc., II. 364.

bre of the ureter, and hypertrophy of the bladder. Salius Diversus had described inflammation of the ureters as a cause of retention of urine. Peter Franco (1561) had figured a special dilator for the enlargement of the female urethra, and a gorget with forceps, whose arms would open in the bladder and seize the stone.

Several authors of the 17th century proved by necropsies the occurrence of vaginal cystocele with prolapsus uteri.[1] Felix Plater and Ludovicus Mercatus (1605) first recognized the vesico-vaginal fistula, and Johann Fatio cured several of them by the quilled suture. Andreas a Laguna (1499-1560) wrote a work entitled: *Methodus cognoscendi, exstirpandique excrescentes in vesicæ callo carunculas,* Rome, 1551, and another upon urethral strictures and their treatment by means of bougies. Finally, Francesco Diaz (Madrid, 1588) was the author of an excellent monograph upon the diseases of the bladder and kidneys.

Thus we have *in esse* catheters of copper and silver (Abulkasis), lithotrites (the mythian-like instruments of the post-Celsian times), dilators of the urethra and forceps for the extraction of foreign bodies (1500 and 1561), bougies of paper and metallic sounds (Heliodorus). What then remained to invent, and why were not the most recent exploratory methods, such as G. Simon's gradual dilatation with specula, and Rutenberg's illumination of the interior of the bladder, discovered much sooner, since the ground was apparently prepared for them centuries ago? It is undoubtedly due, in addition to the above-mentioned reasons, to the absence of instruction in gynecology, until late in the 18th century. Even to-day most gynecologists leave the bladder out of consideration in connection with the female genitals, and at most describe urethral caruncles, displacements of the bladder with the vaginal wall, and vesico-vaginal fistulæ; while the text-books on internal medicine hardly mention the numerous specific affections of the female urethra and bladder. We possess but a single monograph, published by Scanzoni in 1854, upon diseases of the female urinary passages; and in his introduction the author rightly complains of the neglect of this branch of special pathology on the part of the gynecologists. Scanzoni's book went through a second and last edition in 1859; it is therefore entirely incomplete to-day, though we shall often have occasion to make use of its admirable contents.

But however useful and important historical studies may be, and however they may save us from the error of presenting as new what has already long been known, we must admit that there are writers who can find the germ of each and every medical discovery in Hippocrates and Aretäus, and who can so wonderfully elucidate and explain the dark and disputed points in their writings, as to prove that all that living men have done is to rehash their material! Ideas may often have been printed without having ever been carried out; and the proper execution of them is often much more meritorious than an impracticable or dangerous idea. This is the case, for instance, with the urethral dilatation introduced by Simon; the idea was an old one, but we know how often the older methods by dilators and compressed sponges caused incontinence of urine. But Simon laid down exact rules for its use, and for the first time the method became really practicable. Here is another illustration: I mentioned above the opinion of Kurt Sprengel, that Abulkasem was the first to teach the method of cutting for stone in women. Baas[1] thus describes the manner in which the midwife of Abulkasem's time is to perform the operation under the direction of a physician: "In a virgin the finger is to be introduced into the rectum, in other women into the vagina; and the cut is to be made in the first case through the lower part of the left labium, in the second case between the urethra and the pubis, so as to give a transverse wound." Now although Baas[2] has noticed what Sprengel overlooked, that Celsus has described the stone operation in women, he does not seem to have observed that Abulkasis, 1100 years after Celsus, has copied his directions for the performance of the operation almost word for word. In proof thereof I will quote the passage in question,[3] "De calculis feminarum: Hac vero curationes in feminis quoque similes sunt; de quibus parum propriæ quædam dicenda sunt. Liquidem in his, ubi parvulus calculus est, scalpellus supervacuus est; quia is urina in cervicem compellitur quae et brevior quam in maribus et laxior est. Ergo et per se saepe excidit et si in urinæ itinere quod est angustius, inhaeret, eodem tamen unco sine ulla noxa educitur. At in majoribus calculis necessaria eadem curatio est. *Sed virgini subjici digiti tanquam masculo, mulieri per naturalia ejus debent. Tum virgini quidem sublima sinisteriore ora; mulieri vero, inter urinæ iter et os pubis, incidendum est sic, ut utroque loco plaga transversa sit.* Neque terreri convenit, si plus ex muliebri corpore sanguinis profluit."

---

[1] Peyer, Ruysch, im Sepulchret, observ. 5.

This passage proves that Celsus appreciated the dilatibility of the female urethra, and was aware that calculi might pass through it either unaided or with the help of a hook or forceps-shaped instrument. But his directions for the performance of the operation in the virgin are by no means explicit; they might refer to a vestibular incision as well as to the lateral cut. And even the method of Abulkasis, described almost 1100 years later in Altasrif, and used throughout the middle ages, is not much plainer; since we are not told whether the incision is to be made outwards from the introitus vaginæ, or externally beside the tuber ischii. We find that Hiob van Meeckern, in 1659, still operated according to the rule of Celsus; so that in 1500 years the need of a clear description of the operation in the place of these vague directions was not felt. We will all admit that science and its representatives honor both themselves and their predecessors by a proper knowledge and appreciation of what has been done in the past (Baas); and it is unfortunate that in recent times the study of the history of medicine in universities of the German tongue has been neglected (Billroth). Nevertheless it is unjust to depreciate the achievements of recent date, on account of obscure historical discoveries. The following chapters will, I think, prove that in the special field which we are studying, the most important progress has been made in very recent times. We will consider the past history of every disease and anomaly in its appropriate chapter.

---

[1] Grundriss der Geschicte der Medicin, p. 185.

[2] Ibid. p. 122.

[3] Celsus, Liber VII., Cap. 26, 4 (Ed. of Th. J. ab Almeloveen,) Rotterdam, 1750, p. 481.

Since the appearance of the first edition of this book, a single monograph only has appeared upon the subject. It is that of A. J. C. Skene upon *Diseases of the Bladder and Urethra in Women,* New York, 1882, W. Wood, 374 pp. 8vo. Besides this there is a general disquisition upon the subject by C. Cushing: *Diseases of the Female Bladder and Urethra.* A clinical lecture. Pacific Med. and Surg. Journ. San Francisco, 1881-82, xxiv p. 449-456.

CHAPTER II.

PRELIMINARY REMARKS UPON THE ANATOMICAL AND PHYSIOLOGICAL PECULIARITIES OF THE FEMALE URETHRA AND BLADDER.

THE female urethra averages 1 to 1½ inches in length, and runs in a straight or slightly-curved line from below upwards and from before backwards. (See Fig. 1. p. 7.) Its anterior extremity is .4 of an inch below the symphysis; it is kept in place by the ligamentum pubo-vesicale medium, which fills the space between the urethra, the ligamentum arcuatum, and the rami of the clitoris. The urethral wall is tough, and about ⅕th of an inch thick; the septum becomes thicker at those spots at which it is united to the vagina. Its mucous membrane possesses, according to Robin and Cadiat, more elastic fibres than any other in the body. Its lowest part is lined with stratified pavement epithelium, like that of the vagina; while the epithelium of its upper part resembles that of the bladder. Oberdieck, however, found in three out of four cases a single layer of cylindrical epithelium, consisting of long prismatic cells, between whose pointed lower ends small round cells were scattered. Besides this the urethra shows longitudinal folds, vascular papillæ, and among the numerous lacunæ near the external orifice various projections, especially in pregnant and puerperal women.

To Prof. Skene (see page 5) is due the credit of having specially described the two chief lacunæ near the *orificium urethræ externum;* he considers them glandular, and found concretions in them. But Oberdieck and Schüller claim that they possess no real glandular epithelium. Kocks declares them to be simply Gartner's canals; but this has been disproved by Dohrn, Oberdieck, Rieder, and Schüller. The latter calls them urethral passages. He found them most developed in pregnant women, being short and narrow in children and those who had reached the climacteric. Their orifices are about one twenty-fifth of an inch in diameter; they then enlarge, dip deeper down into the tissues than do the ordinary lacunæ of the urethra, and run upwards along the walls of that channel. They are about 1¼ inches in length, though a probe can only be inserted to the depth of about one inch. As they go upwards they subdivide until eventually there are seven to eight epithelial-lined tubes present. The ultimate tubes lie in the circular muscle of the urethra, being sometimes among its outermost fibres. Their diameter before division is about one line; in children it is half a line. The epithelium is transitional, and is easily distinguishable from the single or double layered and occasionally ciliated cylindrical epithelium of Gartner's canals.

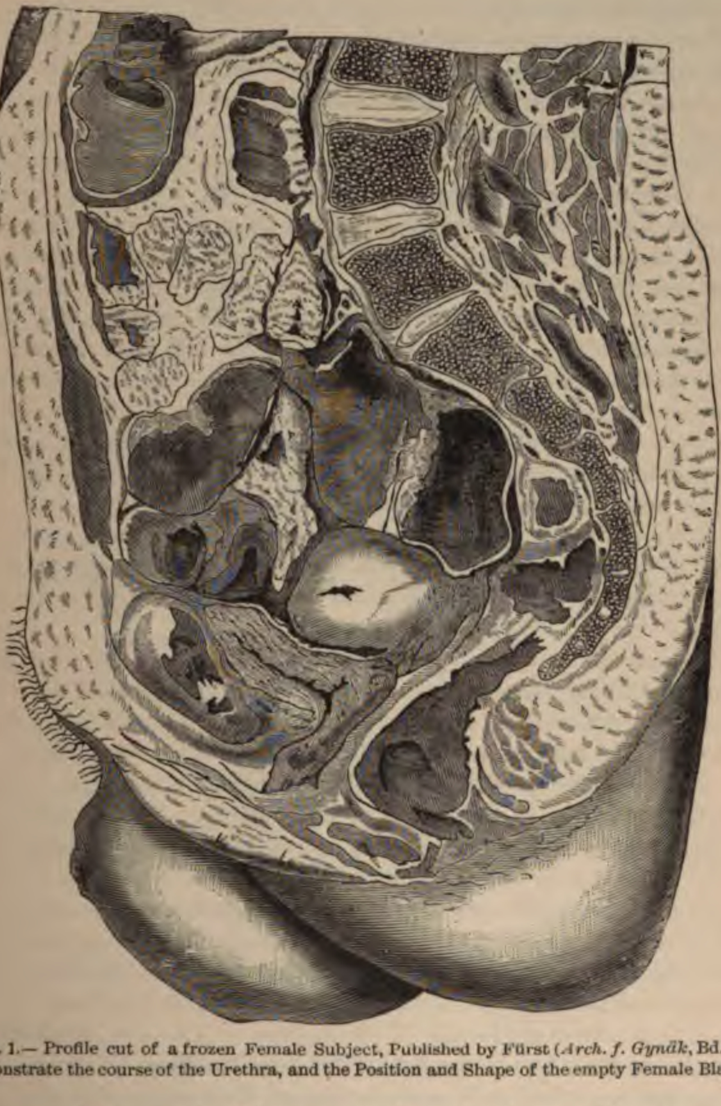

FIG. 1.— Profile cut of a frozen Female Subject, Published by Fürst (*Arch. f. Gynäk*, Bd. VII.) to demonstrate the course of the Urethra, and the Position and Shape of the empty Female Bladder.

The remaining urethral lacunæ are irregular in number, symmetry, and position. Sometimes several of them open into a pocket, which may be large enough to entangle the point of a catheter (Oberdieck). At their blind end the epithelium is in single layers and cylindrical; it then becomes stratified cylindrical, and near their mouth becomes pavement.

Besides this the mucosa contains a multitude of small mucous glands, which in elderly persons often contain small black particles, similar to the prostatic concretions.

Below the mucosa is a submucous elastic network, into which the ends of the above-mentioned glands project, surrounded by a network of minute veins. External to the submucosa is a layer which varies in thickness at various periods of life, and is composed of a longitudinal and a circular layer of muscular fibres, united by connective and cavernous tissue. It is the *corpus spongiosum urethræ.* Dr. Uffelmann found, besides the organic circular muscular layer a layer of voluntary fibres lying outside it, and composed of transverse and longitudinal portions. The transverse are innermost, and form the voluntary or outer sphincter of the bladder. They form a complete ring from the bladder end of the urethra to its middle. This discovery explains the fact that, when injuries to the urethra reach ⅜ of an inch from the external orifice, continence of urine may be attained by operative union. Luschka claims also to have discovered an especial sphincter urethræ et vaginæ, which is ring-shaped, flat, and situated immediately behind the bulbi vestibulæ; it is ⅙ to ¼ of an inch broad, and surrounds not only the introitus vaginæ and urethra but closes the latter by compressing it against the septum urethro-vaginale. Bordering on the cavernous venous plexus surrounding the urethra, it inosculates with the anterior end of the transversus profundus muscle.

The internal or cystic opening of the urethra is a slit, the mucous membrane lining which is thrown into longitudinal folds; the external orifice is an oval vertical opening ⅙ inch long. There are often two projections of the mucous membrane from the anterior orifice, which, meeting behind in the urethral wall, join the hymen externally, and give a rosette appearance to the orifice of the urethra. The diameter of the urethra, some ⅙ inch, can be greatly increased by means of instruments.

The following are the most important differences between the female and the male bladder: in the woman the organ is broader and rounder, and is less deep antero-posteriorly, since the genitals are placed between it and the rectum. As a rule the capacity of the female bladder is greater than that of the male; 6½ pints have been found in it in cases of retention. In the male the fundus of the bladder rests securely against the anterior rectal wall; but in the female this is not the case. Here the anterior and posterior vaginal walls are so subject to dislocations and lesions, that the bladder is often displaced, and its fundus loses all support when there is considerable pressure from above and the labial cleft is open. There is also some difference between the sexes in regard to the extent to which the peritoneum covers the posterior bladder wall. It does so to a much less extent than in the male, being reflected at the level of the internal os from the bladder to the uterus. The relations of the female bladder to its surroundings are very important; as we see if we examine Fig. 1 p. 7 and Fig. 3 p. 11. The round and broad ligaments, the uterus and the ovaries, the small intestine and the vermiform process, are all in relation to one another. So often does disease in these neighboring organs affect the bladder, that there are a large number of maladies of that organ which occur in women, and do not occur in men. We need only call to mind the various changes in shape and position caused by uterine displacements, or the perforations of the bladder caused by extra-uterine fœtal sacs, or stones caused by perforating fœtal bones or by hairs from dermoid cysts of the ovary. And so also we may mention inversion of the vesical mucous membrane as an example of a disease that only occurs in the female bladder.

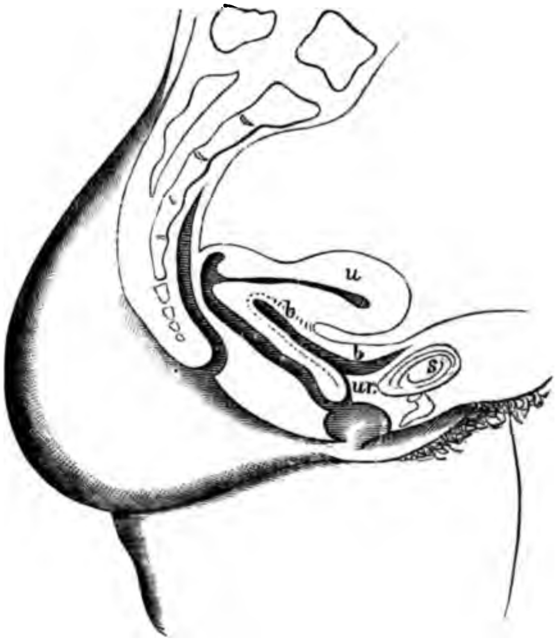

FIG. 2.—Schematic Drawing showing the Normal Form and the Relations of the Empty Bladder (*bb*) and Urethra (*ur*) to the Symphysis (*s*) and the Uterus (*u*). (After *B. S. Schultze.*)

As regards the mucous membrane of the bladder, we notice that besides the few round or oval crypts, and the simple or branched acinous glands, there are found at the fundus in some cases solitary lymphatic follicles and closely-packed rounded papillæ. According to Landau the epithelium of the urinary bladder is extremely elastic, so that it can suffer very considerable extension without solution of continuity. Oberdieck, experimenting with rabbits, found that it consisted of four layers; first one of large, flat, irregular cells with round or oval nuclei; then one of cubical cells with long processes at their lower borders; then a layer with thin processes that dip down into the connective tissue; and lastly a layer of small round or oval cells with large nuclei and karyokinetic figures. These latter are the replacement cells of the epithelial layer of the vesical mucous membrane. Stretching the bladder obliterates the folds of the mucous membrane, and diminishes the thickness of the epithelium, chiefly through a change of position of the cylindrical cells of the third layer. In five cases Oberdieck could demonstrate only once the presence of crypts lined with cylindrical epithelium in the rabbit's bladder. As is well known, the bladder possesses a triple muscular layer, whose thickly interlaced fibres form the detrusor urinæ muscle, and at the ostium urethrale form a perfect sphincter. About one inch behind or above the orificium vesicale urethræ two small tumors are formed by the ureters as they bore their way through the vesicular wall; they are united together by the so-called ligamentium inter-uretericum (compare p. 17 Fig. 7). It was formerly supposed that the closure of the ureters was effected only by the fold of mucous membrane which the oblique position of the ureter in the vesical wall caused; but Jurié's later investigations show that it is brought about by the elastic tension of the muscular fibres among which the vesical extremity of the ureter lies.

In many vesicular diseases it is of importance to decide how the inner surface of the bladder acts as an absorbing organ. L. Schäfer (*In. Diss. Giessen,* 1870) believes that under normal conditions of urination, there is a constant though small absorption of water by the walls of the bladder; and he believes that he has proved this by finding that after the production of a vesical fistula in animals, the urinary secretion was increased 2.3 to 4.5 per cent. On the other hand Susini[1] injected solutions of iodide of potassium and infusion of belladonna into his own bladder, but was unable either to detect the former in the sputum, or to appreciate any physiological action from the latter, even after several hours retention. The results obtained by Allen[2] agree with this, as do the experimental conclusions of P. Dubelt concerning the origin of vesical catarrh. It seems hardly to be doubted that while the urethral mucous membrane readily absorbs when in its normal state, the vesical mucous membrane with uninjured epithelium does not absorb substances like strychnine, morphine, atropine, and iodide of potassium, save when its epithelium has been injured or is diseased. Cazenave and Lépine, on the other hand, found that not only the normal constituents of the urine, but uric and phosphoric acids, were absorbed; and Landau could, after the injection of ½ of one per cent. solution of iodide of potassium and chloride of lithium in two cases, demonstrate iodine once in the sputum, and prove the absorption of lithium once by spectral-analysis.

---

[1] De l'imperméabilité de lépithelium vesicale. Thèse de Strasbourg, 1867.

[2] Gaz. des Hôp., p. 610, 1871.

There exists considerable variety of opinion as to the method of closure of the bladder. Rosenthal and von Wittich no longer regard the sphincter vesicæ (so-called) as a muscle which is kept by the nervous system in a tonic state of contraction; they look upon it as intended to completely empty the urethra of urine. It is assumed on the other hand, that the ring of elastic fibres prevents the outflow of the urine through the urethra; but that as soon as the tension of the bladder wall, from the contained urine, overcomes the elasticity of these parts, a drop of urine attains the urethra, the desire to empty the bladder is set up, and the act now occurs voluntarily. But the cases of healed urethro-vesico-vaginal fistula, when the neck of the bladder and the upper part of the urethra have been de-

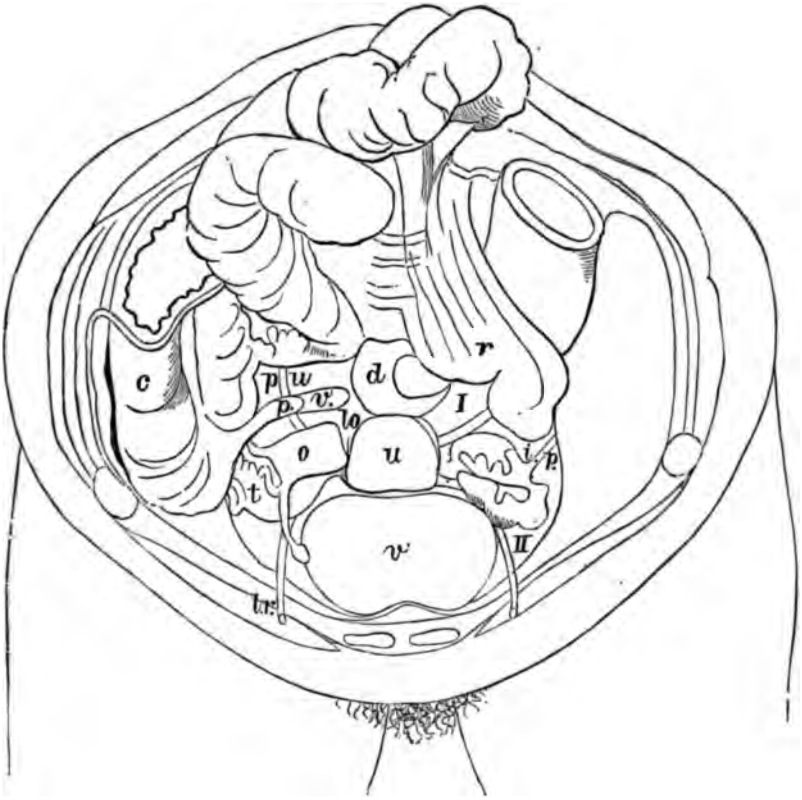

FIG. 3.—POSITION OF THE ORGANS AT THE PELVIC BRIM. (After *Hasse*, *Breslau*). *v*, Vesica. Uterus. *t*, Tuba. *o*, Ovarium. *c*. Cæcum. *r*, Rectum. *lr*, Lig. rotundum. *pv*, Processes vermiformis. *d*, Cavum Douglasii. *pu*, Plica ureterica. *I*, Fossa paruterina. *II*, Fossa paravesicalis. *lp*, Lig. infundibulo-pelvicum.

stroyed, and when the lower portion of the canal has sufficed to retain the urine, shows that the muscular tissue of the urethra is sufficient, of itself, to prevent an involuntary outflow.

The bladder, when empty, lies against the symphysis pubis, projecting somewhat above its highest point. Its wall is about $\frac{1}{4}$ inch thick, and its shape according to Fürst is such, that a short portion ($\frac{3}{10}$ inch) is vertical, a longer portion (1 inch) is arched from the symphysis, and a portion half an inch in length stretches to the level of the internal os uteri. The form of the cavity is, therefore, that of a narrow slit with three processes, of which the anterior is the longest.[1] According to B. S. Schultze,[2] the form of the empty bladder (comp. Fig. 2) is slightly different. The anterior vaginal wall is attached to the lower posterior one of the bladder; and where this ends, begins the attachment of the bladder to the anterior uterine wall, which reaches to the point where the peritoneum is reflected from the uterus on to the bladder, up to or a little beyond the height of the os internum. The posterior vesical wall, when the organ is empty, forms a sharp angle at the point where the vaginal attachment merges into the uterine attachment; so that if we imagine the woman to be standing upright, the lower wall of the bladder will be attached to the vagina, and the upper wall to the uterus. When the bladder is moderately full, so that it is raised but a little above the entrance of the pelvis (comp. Fig. 3, Hasse,), the sinking of the posterior vesical wall, to which Kohlrausch has drawn attention, is well seen. This same drawing effectively demonstrates the flattening of the bladder by the uterus, and the manner in which the bladder, with the round ligaments, and the peritoneal covering, holds the uterus in place. Berry Hart has lately affirmed that the normal empty female bladder shows an oval figure on median section, and forms with the urethra a more or less extended canal; its vault is therefore convex. The arrangement of the muscular tissue would favor this idea. Only in the puerperal state is the Y shape the rule.[3]

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[1] See Fig. 1, after Fürst. Arch. f. Gynäkologie, VII. p. 419, Tafel II.

[2] Klinische Vortr. von Volkmann, No. 50, p. 409.

[3] Comp. Ed. Med. Journ. xxi. p. 794, March, 1881, and xxv. p. 892, April, 1880; further, Croom J. Haliday, on the bladder during the early puerperal period.—Edinb. Med. Journ. xxviii. p. 883, April, 1883.

CHAPTER III.

THE EXAMINATION OF THE FEMALE URETHRA AND BLADDER.

THE means for the exact exploration of the female urethra and bladder, have been much improved in recent times. Formerly we had to content ourselves with the inspection of the mouth of the urethra and the anterior vaginal wall, and could only use touch and sight in the diagnosis of abnormal conditions of the bladder wall in those cases in which traumatism exposed its surface; and were in other cases confined to the use of metallic catheters and sounds. We are now able to examine with the finger and the eye almost the whole surface of the vesical mucous membrane. To G. Simon belongs the merit of having elaborated a method for the rapid and certain dilatation of the female urethra, and of having given exact rules as to the amount of dilatation which is permissible, and of proving its safety. From the oldest times, indeed, it had been customary to dilate the female urethra for the extraction of stone. (See page 2 et seq.) The Italian surgeon Benevieni (1502), and after him Marianus Sanctus (1506), described it; and Franco (1561) used a special dilating instrument for the purpose. In the earlier years of this century dilatation was effected by compressed sponge, by laminaria, or by Weiss's metallic dilators. Nevertheless Hybord in 1872 could only find recorded twelve cases of bloodless dilatation for the extraction of stone, and the exploratory method was but very seldom used.

Simon's method begins by making an incision $\frac{1}{10}$ inch long with the scissors at each side of the mouth of the urethra, which is the most resisting part, and another $\frac{1}{6}$ inch deep down through the urethro-vaginal wall. The specula are inserted, one after the other; they are made of hard rubber, and are hollow; each is fitted to a mandrin. (See Figs. 4 and 5.) Simon has 17 different numbers, ranging from $\frac{8}{10}$ of an inch to $\frac{3}{10}$ of an inch in diameter. After the thickest has been introduced, the index finger is inserted into the bladder, the corresponding middle finger being in the vagina, the other hand pressing the vault of the bladder against the index finger. Every portion of the bladder save the highest corners can be explored in this way; and the narrowest urethræ can be dilated in from 5 to 7 minutes. While Heath, when he dilated with his finger alone, always found the mucous membrane of the urethra torn under the arch of the pubis, and usually had twenty-four hours of incontinence of urine, by Simon's method ruptures of the mucous membrane rarely occur, and the patients can retain their urine completely after the operation. Simon has laid down exact rules as to the extent to which dilatation may be carried without causing incontinence. He found that in the full-grown woman, plugs of 2½ inch circumference, = ⅘ inch diameter, can be used without danger; and that in extreme cases, where somewhat hazardous means are justifiable, dilatation up to 2.6 or even 2.8 inches might be done. In young girls the diameters must be proportionately diminished. With this degree of dilatation incontinence need not be feared, and it is amply sufficient in most cases for diagnostic and therapeutic purposes. I have had occasion often to make use of Simon's method, and can vouch for the accuracy of his statements. In spite, however, of the prescribed incisions made at the edges of the external orifice, one or other of them has always torn further, and a lesion has occurred at the base of the clitoris. But from the pressure exercised upon the parts by the speculum, the bleeding has been usually insignificant, and has soon stopped after withdrawal of the instrument. These incisions,

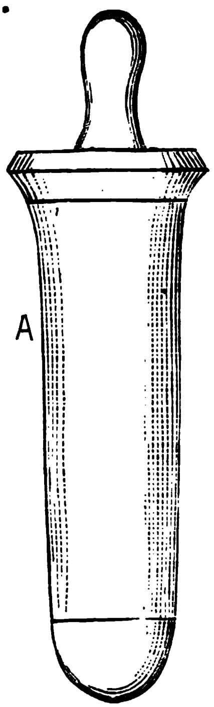

Fig. 4.—Urethral Speculum. (After *G. Simon.*) 7-10 inch diameter, 2 2-5 inch circumference. Natural size.

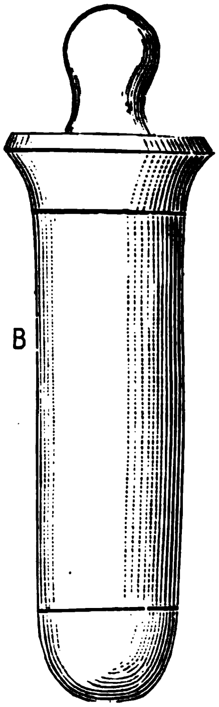

Fig. 5.—Urethral Speculum. (After *G. Simon.*) 4-5 inch diameter, 2 1-2 inch circumference.

therefore, are not always necessary; and they should, with all other fissures, be sutured immediately after the operation with fine silk. Incontinence has never occurred in my cases. I must add that while I was unable after the ordinary dilatation of the urethra, for the extirpation of a papilloma vesicæ, to introduce an instrument into the bladder, alongside the index finger of the left hand, I could easily do it after dilatation with Simon's specula. Nor is this instrumental dilatation tiresome for the operator. As I show in my gynecological operative course, the dilatation of the urethra, and the palpation of the internal surface of the bladder can be well demonstrated and practised on sublimate preserved subjects.

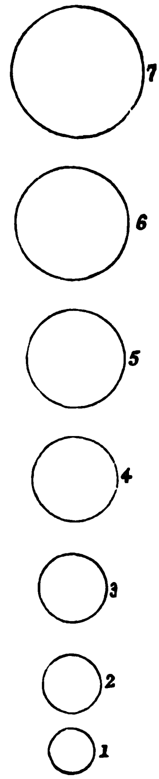

FIG. 6.—The various numbers and sizes of the Urethral Speculæ of G. Simon.

Seneca (New York) has lately described a new urethral dilator, which figured in the *Illustr. Monatschrift der Artzl. Polytechnik*, 1882, part 7, which consists of four rounded steel rods, each one of which is united to a central axis by a cross arm. The dilating part is four inches long, and the highest degree of dilatation attainable is two inches, which may be read off upon a graduated quadrant. Similar, but covered with a rubber hood, is the dilator of Kurtz.[1] Neither instrument possesses any advantage over that of Simon; in fact, they are not so good, since they do not dilate the whole uterine periphery evenly.

If urethral dilatation does not suffice for the accomplishment of our object, we must have recourse to the method of vagino-cystic incision, which has also been recommended by Simon. By this means we can invert the bladder in the vagina and even between the vulva, and can employ not only palpation, but inspection for its examination. Simon's cystotomy with artificial inversion is done by making an incision $\frac{1}{10}$ of an inch in front of the anterior lip of the os uteri in the anterior vaginal wall, and some 1½ inches in length. From its middle a cut ¼ of an inch long is made to the urethra, giving a T-shaped incision. A thin double hook is inserted into the bladder through the cut, and is hooked into the mucous membrane; at the same time the other hand depresses the bladder forcibly above the symphysis. The incisions are best done when the vagina is dilated by a Simon's dilating instrument, or a Bozeman's speculum, and the bladder wall is tightly stretched; or it may be accomplished by dragging down the uterus and the upper part of the vesico-vaginal wall. The bleeding is stopped by ligature or torsion, and after the operation upon the internal surface of the bladder is finished, the cut edges are united with thread. Union takes place easily, since the parts fit together well.

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[1] Centralblatt für Chir., 1883, No. 41.

Simple dilatation of the urethra is of service principally in the diagnosis of diseases of the vesical mucous membrane, and in the detection of foreign bodies and stones, and in their extraction. It is also useful in the cure of fissures of the urethra, for the recognition of defects in the vesico-vaginal wall, when the vagina is closed, for the diagnosis of the seat and extent of growths and tumors of the bladder wall, for their extirpation, and for the cure of vesico-intestinal fistulæ by the cauterization of the vesical mouth of the fistula. Besides this it has been recommended for the treatment of obstinate vesical catarrh by local application of concentrated caustics (Heath), for the finding and extraction of renal calculi in the vesical end of the ureter, and finally for the opening of hæmatometra, whose evacuation between the bladder and the rectum is impossible or dangerous (as Spiegelberg and others have used it). The method is, therefore, of great diagnostic and therapeutic value. If Silbermann (l.c.) in 48 cases of rapid dilatation of the female urethra, found incontinence occurring 8 times, this was because most of his operations were not done in accordance with the rules laid down by Simon, nor with his instruments; and they cannot reflect upon the value of Simon's method.

In cases of very large stone with considerable vesical tenderness, or in the extirpation of tumors situated so high up on the lateral vesical wall that they cannot be reached through the dilated urethra, and in cases of operation for vesico-intestinal fistula, the T-shaped incision above described will be necessary. Sims, Emmet, Bozeman, Simpson, Hegar, and Simon have employed it also in cases of obstinate vesical catarrh with ulceration of the mucous membrane, to prevent the stagnation of decomposed urine in the bladder. Simon remarks, however, that the results obtained from the operation for this indication, were such as to cause him to regard it as being yet *sub judice.*

After dilatation of the urethra to the extent of admitting a finger and instrument into the bladder, a further exploratory method, also introduced by G. Simon, may be undertaken. It is the sounding and catheterization of the ureters, which may be of use in diseases of the ureters and kidneys. The orifices of the ureters will be found about 1 inch from the vesical orifice of the urethra in the so-called lig. interuretericum (Fig. 7). They may be felt as prominences about half an inch from the median line. These prominences being fixed with the index finger of the left hand, the head of a small sound is carefully guided to the spot; the hand is now carried to the side opposite to the one of the ureter that is being sounded, and against the arcus pubis, and by a gentle pressure the sound is inserted in the ureter. With the finger tip the entrance of the sound is to be guided. With instruments of sufficient length the pelvis of the kidney may be attained. The sound must first be carried some three inches from within outwards; and when the bony margin of the true pelvis is reached, the handle must be depressed and carried towards the thigh on the same side. Thus the anterior portion of the sound is held parallel to the spinal column, and its head is directed somewhat towards the anterior abdominal wall, and easily reaches the pelvis of the kidney. Simon has provided two instruments, a urethral sound, and a urethral catheter, for this purpose. (Figs. 8 and 9.) They are ten inches long, and inflexible, since a flexible metallic instrument could not straighten out the curve which the ureter takes in its passage from the bladder to the margin of the pelvis.

With these instruments Simon accomplished the operation 17 times in 11 different women, introducing the sound 9 times, and the catheter 8 times; and in no case did he do the slightest damage by the operation. It is true that he had no further opportunity to use catheterization of the ureter; but he believed it to be possible by this means to ascertain the presence of calculi in the ureters, and even in the pelves of the kidneys. He also claimed an especial advantage in obtaining urine direct from the kidneys without its having passed through the bladder. Stones found in the vesical end of the ureters could be cut out or extracted; or if they were near the renal mouth of the ureter, they might possibly be crowded back into the pelvis of the kidney. Strictures also might be dilated; and hydronephrosis occurring as it commonly does, with a pervious ureter, might be evacuated by means of the urethral catheter. These anticipations, however, were a little too sanguine. The operation would certainly

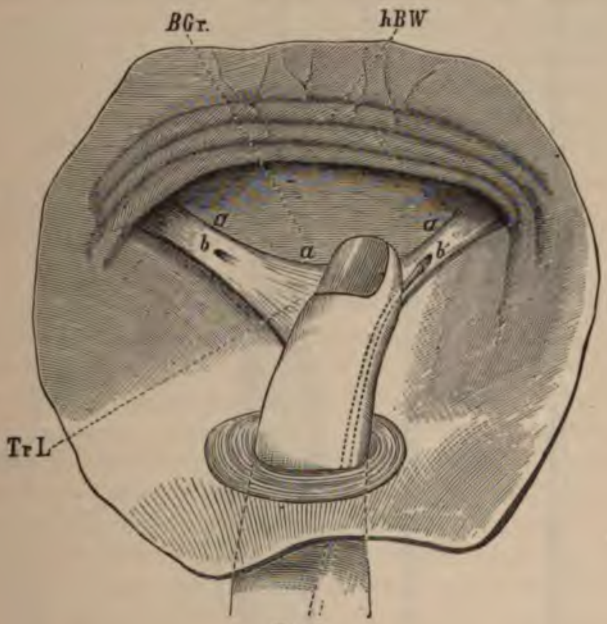

Fig. 7.

not always be harmless. The straightening of the bend above-mentioned, would necessitate a more or less extensive laceration of the mucous membrane, at least. Nay, perforation of the ureters might occur, especially when strictures of the ureters, or changes of position from tumors of the uterus, vagina, ovaries, pelvis, etc., were present. Even sudden movements of the deeply narcotised patient, as of vomiting, might cause an accident of so serious a nature as to render us very cautious in view of the problematical advantages of the exploration. Luckily the diseases calling for catheterization are rare. Indeed I must admit, that although I have tried in every case in which I have dilated the urethra, I have never, in spite of the greatest patience, been able to introduce a sound into a ureter.

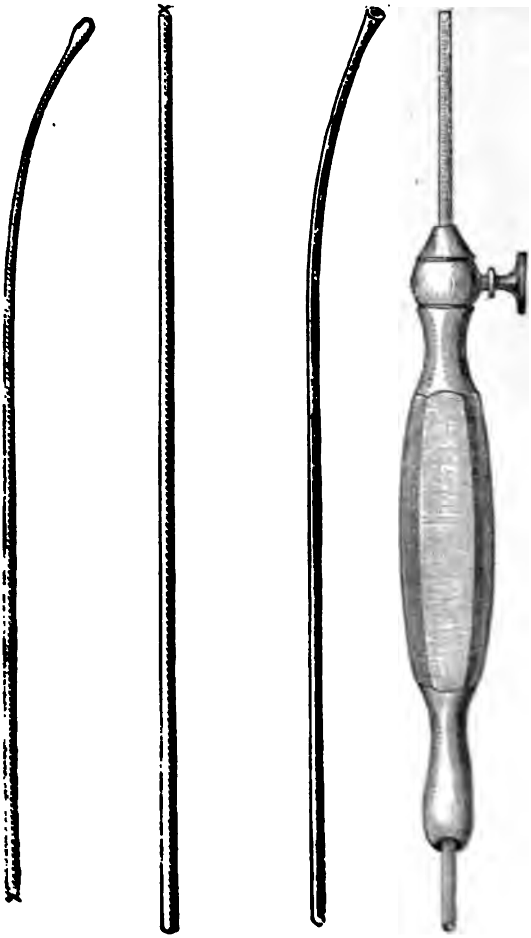

Fig. 8. Fig. 9.

Figs. 8 and 9.—G. Simon's Urethral Sound and Catheter.

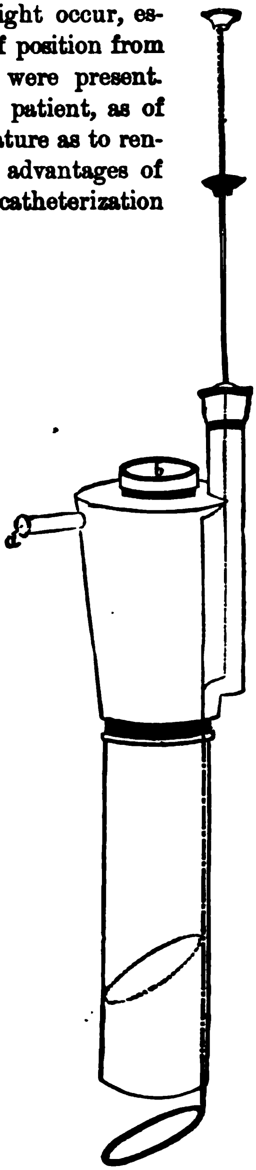

Fig. 10.—Rutenberg's Speculum.

The attempt has been made in the past to illumine the female urethra and bladder, and so lay them open to inspection. Grünfeld used a straight tube of varying diameter with a funnel-shaped mouth, and provided with a reflecting glass at its inner end. He claimed to be able to recognize with this instrument the most delicate changes of color of the mucous membrane of the bladder and urethra. Ultzmann and Fürth confirmed his assertions. With the aid of a gas or oil flame we can, with Simon's mirrors, obtain a good view of the posterior and lateral bladder walls. But the anterior and antero-lateral portions of the vesical mucous membrane can not be readily brought into the field of view; nor can we in this mode of examination fix our position, since the posterior bladder wall is applied to the opening of the speculum. Rutenberg, therefore, suggested the stretching of the bladder, and first tried to do so with water; but he was soon satisfied that air, being more transparent, was more appropriate, and constructed the apparatus figured on Fig. 10. This apparatus consists of the speculum itself, with a stopper, a part to be screwed to this with a fenestrum, and the mirrors. In order to obtain the greatest possible amount of light with a certain diameter, the speculum is made not of hard rubber, like that of Simon, but of German silver. It is of the same size front and rear, and has an internal diameter of 7/10 of an inch, the metal being 1/50 of an inch thick. It is ⅗ inch longer than Simon's instrument, so as to leave room to handle the instrument when the other piece is screwed on. This latter part is 1½ inches long, and has a glass fenestrum ⅗ inch long; the glass is of the purest, and is one line in thickness. There is also a tube ⅕ inch in diameter, to which is attached a rubber tube for the purpose of inflation. The patient, unless her urethra has been previously dilated, must be deeply narcotized, and must be kept so during the whole examination. Since inflation of the bladder is extremely painful, and may cause disturbing contractions of the abdominal and vesical muscles, it is advisable to narcotize the patient even in those cases in which the urethra has been already dilated. The patient is placed in the dorsal position, with thighs flexed and fixed by two assistants. After dilating the urethra up to Simon's largest speculum, the bladder is emptied of urine, and the silver tube is introduced. The upper part is now screwed on, without the mirror, the fenestrum having been heated in the flame of a spirit lamp to prevent the condensation of moisture. One of the assistants then inflates the bladder by a powerful expiratory effort applied to the rubber tube, or a bellows may be employed for that purpose. Using the Rutenberg apparatus in this manner I have once seen the bladder immediately blown up upon introduction of the mirror. The other assistant holds the light above the symphysis, which is reflected by a concave mirror like that used in laryngoscopical examinations into the bladder. By moving the speculum in various directions, a large part of the posterior and lower bladder wall can be plainly seen. If we wish to see the remaining portions, the mirror must be introduced, the upper piece being of course unscrewed, and the glass warmed. Examining the living subject Rutenberg found the posterior bladder wall *before* inflation to be of a dirty, grayish-red color; but little was to be seen save the larger folds and indistinct vessels. But when the air entered the gray color gave place to an increasingly vivid red, and through the stretched and transparent epithelial coat the finest vascular net-work can be seen, running along the muscular bundles. Towards the base of the bladder the color of the mucous membrane became darker, the vascularization richer, and through the mucous membrane could be seen the interlaced bundles of muscles. Without using the urethral sound Rutenberg was never able to find the urethral opening.

But beautiful as may be the effect of lighting up the vesical mucous membrane in this manner, it is questionable whether or not there is danger in it. Firstly it may be feared, that under the heavy pressure which is upon the air in the bladder, some of it might enter the ureters, reach the pelvis of the kidneys, and possibly cause pyelitis, or pyelonephritis, an affection which in many cases endangers life. I have used Rutenberg's method in ten cases, and in several of them repeatedly. Instead of a gas lamp I used an ordinary round, low oil lamp, which, as I demonstrated to a number of physicians at the Naturforscherversammlung at Hamburg, gives a sufficient volume of light. My experience is that Rutenberg's method of exploration is absolutely harmless, that it gives splendid results, is easy to exercise, and I therefore welcome it as a valuable addition to our means of diagnosis in diseases of the bladder.

But the question has been asked as to tne necessity for any such method of exploration, since the entire inner surface of the bladder can be palpated with the finger, and the speculum exposes to view fairly large portions of the vesical mucous membrane. But wherever we can use both touch and sight in our examinations, the latter becomes undoubtedly more exact. And all anomalies cannot be felt; hyperæmias, superficial ulcerations, diphtheritic sloughs cannot, though they can be readily recognized with the eye. Palpation of the bladder surface presents considerable difficulty; the speculum shows us only a single fold of the mucous membrane; and if we introduce a small mirror through the cylinder to inspect the anterior wall of the organ, the mucous membrane falls down on all sides, and covers the surface of the mirror. It is necessary to dilate the bladder if we desire to obtain a clear picture, especially of the anterior wall. Besides this, the mirror may be moved around in all directions, without in any way injuring the mucous membrane.

So far I have not succeeded in seeing the orifices of the ureters by means of the mirror in the dilated bladder. Further, it is possible to fasten a small sponge or brush to the metal rod that carries the mirror, and so to apply medicaments directly to the diseased spot, without at the same time involving all the rest of the organ. Certainly Rutenberg's method has a future before it.

Matthews Duncan uses ordinary glass specula of large size, with oblique ends, for inspecting the vesical mucous membrane.

W. Noeggerath is the only one among the authors who have studied the methods of bladder inspection after urethral dilatation, who claims that there is always a reaction after opening the urethra in the manner described. He claims that retention of urine, sensations of burning and heat in the urethra and labia, occasionally cystitis, sometimes abdominal pain, and even perimetritis may occur. I have often noticed a burning pain and dysuria, and once a distinct vesical catarrh, after these examinations; but I can very positively assert that these ill consequences may be easily remedied by washing out the bladder for a few days with Hegar's funnel. Though the method has some drawbacks, they are not to be feared in ordinary cases; they are avoidable, and are of little weight in comparison with the advantages to be obtained. Bridge's so-called case of peritonitis, after rapid dilatation of the female urethra, is noteworthy in that incontinence occurred, although Simon's rules were exactly followed, the patient dying in a typhoid condition a month later. I have recorded a case in my *Pathology of the Female Sexual Organs*, Leipzig, 1881, p. 407, in which, in a woman fifty-four years old, who had suffered for eighteen months from violent dysuria, and whose urine is said to have often been mingled with mucous and blood, a fatal acute double nephritis with anuria was caused by palpation of the bladder after rapid dilatation. The patient had a uterine myoma and a tubo-ovarial cyst, and bladder trouble was suspected, but not found. Hence exploration of the bladder may evidently, under certain circumstances, be dangerous.

One more explorative instrument remains to be mentioned, by means of which the abnormal contents of a bladder may be appreciated without dilating the urethra. We refer to W. Donald Napier's sound, the beak of which is covered with a coating of pure lead, which is to be polished so highly with a piece of leather as to become extremely sensitive to the touch of any hard substance. The beak is then dipped in a 1 per cent. solution of nitrate of silver, and is thus provided with a coat of black so delicate that the slightest touch of a foreign body makes a perfectly distinct impression. A magnifying glass must be used before the instrument is introduced to make sure that there are no impressions upon its tip.

The exploration of the bladder with the manometer, first described by Schatz, has recently been revived by Hegar, Odebrecht, and Dubois.[1] Dubois, following Schatz, introduced a metallic or elastic catheter into the bladder, and united it by means of a rubber tube to a glass tube some

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[1] On the Pressure in the Bladder, Deutsches Archiv. fur Klin. Medicin, von Ziemssen und Zenker, vol. XVII., p. 148, 1870.

60 inches long. The O point of the graduated index was placed at the symphysis, and the height of the column of urine gave the pressure. But he soon found that the level of the top of the bladder did not always coincide with the symphysis, in one case reaching that point only when it contained 23 cubic inches of urine. It was ascertained that the bladder pressure is nearly a constant one, and is independent of age and sex. It rises ½ to 1 inch with each ordinary expiration, and falls again with expiration. In the recumbent position, it amounts to 4 to 6 inches; standing it is 12 to 16 inches; while laughter, coughing, or voluntary effort increases it to 20 to 60 inches. Dubois believes that the pressure of from 4 to 6 inches is not due to the weight of neighboring organs, but marks the tension exerted by the elastic muscular bladder upon its contents. In proof thereof he demonstrated that after removing the organs from the abdominal cavity of a suitable subject, a pressure of 4 inches was attained by the tension of the bladder alone. He also found that the pressure in the rectum is independent of that in the bladder, since it remains the same while the bladder pressure is being diminished by emptying the organ. In a case where the pressure in the abdominal cavity sank to nothing after the evacuation of a considerable amount of ascitic fluid, that of the bladder remained at 8 to 10 inches. Finally, in a case of cystocele vaginalis with prolapsus uteri, in which the influence of the abdominal pressure was excluded, since even the deepest inspiration had no influence upon the height of the column of water, the pressure of the bladder, which contained 9 cubic inches of urine, was 4 inches. Of course the intra-abdominal pressure influences the bladder, and is increased by ascites and meteorism. In myelitis and in fractures of the spinal column, Dubois proved that there was a distinct diminution of vesical pressure. But he always found a positive pressure even with absolute paralysis of the bladder and the abdominal muscles. And he could never, by sudden and intermittent pressure, cause a negative pressure, as Odebrecht claims to have done. Dubois explains the entrance of air into the bladder through the catheter, as being due to variations in pressure of the stream of urine, by which bubbles of air pass between it and the walls of the catheter, and then ascend into the bladder. Hence the important practical rule in catheterization, not to depress the handle of the catheter too much; and if manual pressure upon the abdomen is used to promote evacuation, the catheter must be withdrawn before that pressure is relaxed.

Odebrecht has, however, in one case demonstrated the existence of a pressure less than that of the atmosphere. Here the fundus vesicæ was largely adherent to neighboring portions of the serosa, causing traction upon the bladder, and elongation of the organ. The uterus was adherent to the bladder. Experiments have shown that depressions of the posterior vaginal wall diminish the vesical pressure, since the descending uterus tends to pull the bladder with it. It is to be noted that the introduction of a finger or a catheter into the rectum has the same effect. The escape of gases and fluids cause the anterior rectal wall to sink towards the posterior one, the uterus follows, and the consequent traction causes a diminution of vesical pressure.

We must then admit that it is possible to have a negative pressure in the bladder; but it can seldom occur, and needs a number of concomitant circumstances to effect it. We may easily see that the examination of the vesical pressure in normal and in abnormal conditions of the bladder may be of great importance; its practise is simple and easy, and does not entail any disagreeable consequences upon the patient.

Finally, the bladder may be examined by percussion and auscultation. As Rutenberg has shown, the organ may be very considerably inflated with air, without there being a tympanitic percussion note above the pubis. Marked dullness at that place and above it depends upon the amount of fluid in the bladder, upon the position of the organ, and upon the thickness of the abdominal walls. At its greatest distension the dullness reaches to above the navel, and is melon-shaped. The introduction of the catheter may cause the appearance of two auscultatory signs; firstly the clicking noise occasioned by the contact of the metal with a calculus, and secondly the gurgling noise caused by the entrance of air.

When the organ is distended, and it may contain as much as 128 ounces of urine, it may be palpated for through the abdominal walls; and where its walls are diseased and hypertrophied, it may be possible even after complete evacuation to feel its uneven surface from without.

O. Küstner has constructed a urine thermometer 6.4 inches long, the lower end of which consists of a German silver catheter which contains a small maximum thermometer. This enables us in twelve seconds, during urination, to take the temperature. The instrument may be obtained of Hofmechanicus C. Zeiss, in Jena, for 10 marks; it is to be recommended, especially since catheterization is so frequently necessary in the urethral and vesical diseases of females.

Thus we see that exploration of the female bladder has been greatly perfected in the most recent times. We no longer rely upon external palpation and microscopic and chemical examination of the urine alone. We palpate its internal surface, and examine it closely with the eye; and we are thus enabled to have far better prospects of curing its maladies. These new exploratory methods have already been used for the diagnosis, through the bladder wall of diseases of the organs lying behind it, the uterus, the uterine ligaments, the tubes, and the ovaries. (Noeggerath, Croom.)

CHAPTER IV.

STATISTICAL INQUIRY INTO THE FREQUENCY OF OCCURRENCE OF THE VARIOUS DISEASES OF THE FEMALE URETHRA AND BLADDER.

TO decide the question of the frequence of occurrence of the various diseases of individual organs, we rely partly upon the reports of large institutions, partly upon the monographs of specialists, and partly upon the mortality tables of the various states. The reports of the large hospitals are, however, too imperfect to be of much assistance. Thus the medical report of the Imperio-Royal General Hospital in Vienna of 1874, those of the Rudolph Hospital in the same city, and those of the Royal Charité in Berlin of the same year, give only the following list of cases of urethral and bladder disease:

	General Hospital.		Rudolph Hospital.		Charité.	
	Males.	Females.	Males.	Females.	Males.	Females.
Catarrhus vesicae urin. .	22	3	4	1	—	—
Cystitis " " . .	6	4	1	—	17	10
Paresis " " . .	4	0	1	—	—	—
Dysurie " " . .	1	—Urethritis	—	2	—	—
Enuresis continua . . .	4	—	—	1 nocturna	1	1
Retentio urinæ	4	—	—	—	1	—
Incontinentia urinæ . . .	—	—	—	—	6	1
Haematuria	3	—	1	—	2	—
Strictura urethræ	42	—	8	—	13	—
Fistula "	8	—	2	—	2	—
Ruptura "	—	—	—	—	1	—
Lithiasis "	29	1	—	1	—	—
Fistula vesico-vaginalis . .	—	17	—	2	—	3
" " -abdominalis.	—	—	—	—	—	1

Total, 183 Men and 48 Women
among 25,733 Men and 16,097 Women sick.
Making 0.7% of Men and 0.3% of Women sick.

Such figures may be of some importance in estimating the relative occurrence of these diseases in men and in women. They teach us that urethral and vesical diseases are much more infrequent in women than in men. It would however be erroneous to conclude that 0.5 per cent. of all the sick have maladies of these organs; though the Charité shows 59 cases in 15,013 recorded, the Rudolph hospital 24 in 6,254, and the general hospital 141 in 20,563. Such a conclusion we will show in future pages to be precipitate and unwarranted.

We must exercise care in accepting the statistics of the various specialists, Simon, Sims, Bozeman, and others, since many cases came to them that were pronounced incurable by other physicians; and their statistics as to the occurrence, frequency, and causes of the various diseases will vary with the conditions prevailing in the regions whence their patients are drawn. Where authors have collected all the cases to be found in current literature, their statistics are apt to exclude ordinary cases, which are not reported, and hence to be erroneous. Thus, to cite but a single instance, the excellent article by Ed. F. Boucqué on the treatment of uro-genital fistula in women by secondary union (Paris, 1875) often mentions pregnancy as a cause of fistula, without specifying any of the circumstances of the delivery, since the physicians reporting the cases themselves mentioned none. Then, again, among his 204 fistula only 8 per cent. are non-puerperal, the author not mentioning or taking into account in a monograph upon the cure of fistula incurable ones such as those caused by epithelioma. So that not even upon the points specially discussed do we get reliable data, though they are the best available to us.

I know of only one set of disease reports from which any certain facts can be gleaned, and they are those of the medicinal district of Meissen from 1867-72. They show that among 58,466 sick people, 353 had kidney disease, 399 had bladder disease, and 577 had gonorrhœa. This makes vesical diseases rather more frequent than those of the kidneys, and rates them at 0.68 per cent. of the whole.[1] The more attention is directed to any special affection, the more frequently it is found. In my reports on 3775 sick females, there were 246 cases or 6.5 per cent. of diseases of the urethra and bladder; but 118 of these, or 15 per cent. occurred in the last 776 cases. It is worthy of remark that cystocele vaginalis was noticed 68 times, being 27 per cent., since it is so seldom found at the autopsy (see below).

If we now finally turn to the tables of mortality for information as to bladder and urethral affections, we shall obtain but little satisfaction, since the question is so general a one. Thus in Vienna, in 1874, out of 17,316 deaths only 33 men and 6 women, or 0.2 per cent. of the whole, are registered as having succumbed to diseases of these organs.[2]

In order to obtain statistics of some accuracy, I applied to the former Pro-sector of the Dresden City Hospital, Professor Birch-Hirschfeld, who kindly placed the records of his department at my disposal.

In the Dresden City Hospital in the twenty-five years from 1851 to 1876 there were made 6861 autopsies, 4147 being on males, and 2714 on females. In 209 of the latter the records were not properly kept, leaving us 2505 autopsies as a basis for our statistics.

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[1] Report of the K. S. Landes Med. Colleg. for 1874, Leipz., H. Vogel, 1875.

[2] Innhauser-Nusser, Jahresb. des Wien. Stadtphysikates for 1874, Wien. Braumüller, 1875.

Of these 184 or 7 per cent. showed *post-mortem* evidences of urethral or bladder disease:

I. *Affections of the Urethra:* Malformation, malposition, inflammation, new growth, once each, 4 times=2.1 per cent.

II. *Affections of the Bladder:* (*a.*) Malformations (acquired,) 10 times =5.7 per cent.; diverticulas, 4 times; dilatations, 5 times; scar, 1 time. (*b.*) Fistulæ due to violence, 2; due to carcinoma, 36=38 times=26.5 per cent. (*c.*) Malpositions, 0 times. (*d.*) Inflammations, 72 times=39.1 per cent.; hyperæmias, 4 times; hæmorrhages and ecchymoses, 21 times; catarrhs, 16 times; cystitis purulenta, 6 times; cystitis diphtheritica, 4 times; cystitis crouposa, 4 times; ulcers of mucous membrane, 2 times; abscess of bladder wall, 4 times; cystitis chronica, 4 times; œdema of wall, 1 time; pericystitis, 2 times; tuberculosis, 4 times. (*e.*) New growths, 41 times=22.3 per cent.; carcinoma vesicæ, 37 times, (non-perforating); muscular hypertrophy, 4 times. (*f.*) Functional anomalies, 6 times=3.2 per cent.; incontinence, 3 times; paralysis, 3 times. (*g.*) Abnormal contents, 13 times=7 per cent.; stony concretions in vesical mucous membranes, 7 times; calculi, 6 times.

Gurlt found[1] in 101,411 sick cases in the three largest Vienna hopsitals, 16,637 suffering from tumors. 11,140 of these were women, and 16 had tumors of the urethra, 1 fibroma, 3 papillomata, 3 polypoid growths, 1 sarcoma, and 8 carcinomata. 20 had cancer of the bladder, as against 46 men that suffered from it.

I myself found among 575 female autopsies the following diseases of the urethra and bladder:

Malpositions:	cystocele,	7 times.
Malformations:	dilatation,	42 “
	diverticulæ,	10 “
New growths:	cysts,	1 time.
	fatty polypus,	3 times.
	carcinoma,	12 “
Disturbances of nutrition:	hypertrophy,	29 “
	inflammation,	31 “
	tuberculosis,	5 “
Wounds:	fistulæ,	2 “
	perforations,	1 time.
Foreign bodies:	calculi,	1 “

Thus 25 per cent. of all female autopsies showed some trouble in the bladder.

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[1] Langenbeck's Archiv., vol XXV., part 2.

PART I.

MALFORMATIONS AND DISEASES OF THE FEMALE URETHRA.

CHAPTER V.

THE CONGENITAL MALFORMATIONS OF THE FEMALE URETHRA.

UNDER normal circumstances, the Müllerian ducts at the seventh week of embryonal life adhere to the wall of the genital cord, and open into the sinus uro-genitalis. At the tenth week occurs the separation of the intestine from the uro-genital system, by the formation of the recto-vaginal septum (perineum). The urethra, at first absent, is formed by the development of the parts constituting the neck of the bladder so as to form a canal, the septum urethro-vaginali being made in the same way. (Fig. 11.) E. Rose believes that the urethra is formed of three separate parts. The first is the neck of the bladder; the second an infolding of the external skin, forming the glandular part; and the

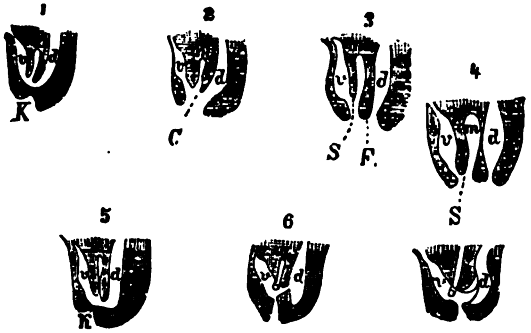

FIG. 11.—*v*. Embryonal part of the allantoic Vesicle. *d*, Tail end of the Intestinal Canal. *m*, Müllerian ducts. *k*, Blind sac on the outer side of the rectal septum. *C*, Cloaca. *f*, Fold between the intestine and the allantois. *S*, Sinus uro-genitalis. In 5 *k* is on the intestine instead of on the allantois. In 6 and 7 the Müllerian ducts open.

third a projection from the posterior extremity of the alimentary canal, a vaginal piece, which projects to meet the anterior portion just as the allantois grows towards the excretory ducts of the primordial kidneys.

The congenital anomalies of the female urethra may, therefore, occur in various ways. Both portions, vaginal and glandular, may be absent, *defectus urethræ totalis;* or the inner portion only may be absent, *defectus urethræ internus;* or the invagination of the skin may not occur, *defectus urethræ externus;* or the vaginal and glandular pieces may miss each other, *atresia urethræ.* In the latter case there is a septum urethræ, which is oblique. If both portions simply develop insufficiently, the septum urethræ will be vertical.

Total absence of the female urethra, *defectus urethræ totalis,* may occur in otherwise normal organs, or it may exist together with other congenital defects. The vestibule shows no meatus, while in the vagina near the symphysis, is a transverse slit, the opening of the bladder. Petit has recorded such a case in a girl four years old, in which clitoris, nymphæ, and urethra were wanting; the vagina was large, and incontinence of urine existed. M. Langenbeck has reported a case of imperforatio hymenis, in which in a girl nineteen years old, vagina and bladder formed a common canal, and incontinence at first existed. Smith (See Hepner, l. c.) found in a girl seven weeks old, a clitoris 1 inch long, under which was a triangular opening, which led into the vagina; and the vagina, 2 lines in diameter, had an opening in its anterior wall, which led into the bladder. Behncke's case belongs to this latter class.

Though Heppner classes his case, in which the vestibule showed traces of the anterior and lateral walls, as an example of true female hypospadia, it is to be doubted if he does so correctly, since the patient in her third year was operated upon for stone. The incontinence of urine from which the patient suffered was not influenced by the operation. Heppner's drawing of the malformation gives one the idea that it might be due to a traumatic destruction of the urethra, rather than a congenital defect.

Congenital atresia urethræ occurs when the middle or vaginal portion of the urethra is wanting, or when the vaginal and glandular pieces miss each other, or are imperfectly developed. Duparcque found the first variety of atresia, defectus urethræ internus; the urethra was open to the bladder, the bladder was closed, and both that organ and the ureter were markedly dilated. A case of E. Rose's illustrates the second variety, in which the glandular and vaginal portion had missed each other, the urethra was crooked, was solid for a certain extent, and thus caused hydrops vesicæ urinariæ, hydro-necrosis and ascites. Besides this there was uterus bicornis septus, vagina septa. To this category belongs also Schatz's case: double uterus, double vagina, double bladder, double congenital vesico-vaginal fistula, the first case on record of a complete division of the entire uro-genital system ! The external genitals were normal, and an opening leading into a *cul-dé-sac* ¼ of an inch deep represented the meatus urinarius. This was the normally developed glandular portion of the urethra. Each bladder opened into the corresponding urethra. (Fig. 12.)

Hypospadia is a further malformation of the female urethra. Van Mosengeil has described such a case. The girl was eight years old, and had a large clitoris with a well-developed prepuce. The meatus was not situated at the usual distance from the opening in the hymen, but formed a half canal, the lower wall of which was absent to a considerable extent. Deep down behind the orifice of the vagina was the completely closed portion of the urethra, about .4 of an inch in length. The bladder itself was large, and had many diverticula. Lebedeff's case, shown in Fig. 13, is still more instructive. Lebedeff succeeded in giving her the power to retain urine for a considerable time in any position. He did several plastic operations, and later used electricity, placing one electrode on the symphysis, and the other in contact with the vaginal scar.

Fig. 12.

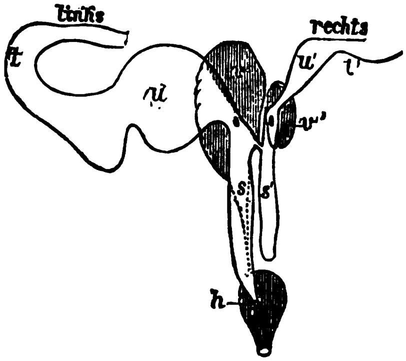

FIG. 12.—TOTAL SPLITTING OF THE URO-GENITAL SYSTEM. (After *Schatz*.) *u'* and *u*, Uterus. *v'* and *v*, Vesica urinaria. *t'* and *t*, Tuba. *s'* and *s*, Vagina. *m*, Glandular portion of urethra.

The other form of hypospadia may be regarded as persistence of the sinus uro-genitalis. There is an orifice between the clitoris and the perineum which leads into a canal, and then divides into two passages, one being the bladder, and the other the vagina. Willigk (O. Heppner) has given us the best description of this monstrosity: A woman forty-six years old died of a phlegmon. Her penis-like clitoris was 2¼ inches long. The uro-genital canal was of the thickness of a catheter at its entrance, ran in bow-shape under the arch of the symphysis, and ½ inch behind its opening in the skin it divided into an anteriorly placed urethra 1 inch long, and vagina 2 inches and 10 lines in depth. In this class we must place the cases of Debout (S. Fürst), Huguier, Jumné, Coste, Debrau, and Engel. There was atresia vaginæ, and the passage opened into the urethral canal.

Symptoms of these malformations.—The most important consequence of a total urethral defect is the inability to hold water. According to Heppner's reports those persons who with the defect have stricture of the vagina are better situated than those that otherwise than it have normal genitals; since very probably the bulbo-cavernosus muscle that encircles the sinus uro-genitalis is capable of voluntary contraction. The patient's condition is a miserable one if there is permanent incontinence of urine. (See symptoms of vesico-vaginal fistula.)

If the atresia urethræ has occurred within the uterus, there is usually hydropsy of the bladder, the ureters, and the kidneys, together with ascites. The stomach of the fœtus is enormously swollen, and may form a serious obstacle to delivery, so that sufficient force to rupture the abdominal walls, or tapping, is necessary before the child can be born. Examples of such cases have been recorded by Paul Portal, Delborier, Moreau, Freund, Hecker, and others. (See Rose, l. c.) Such children of course are usually born dead. Very different is the case, however, when from the tension of the bladder the urachus has opened, and a urachus-fistula been established. The urine then issues from the region of the navel continuously, the orifice being surrounded with comb-like outgrowths. (See Cabral's case.) In Bonnett's very interesting case[1]

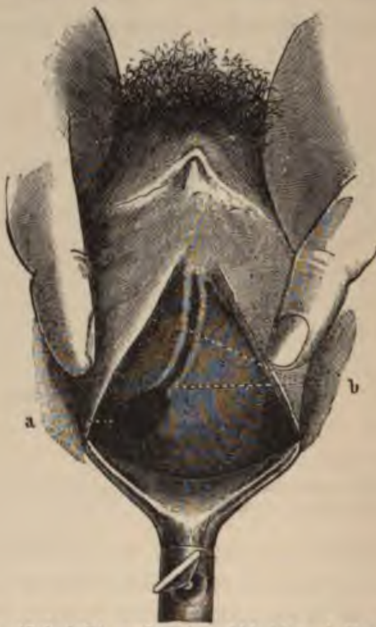

FIG. 13.—HYPOSPADIA. (*Lebedeff.*) *a*, Opening of bladder. *b*, Furrow in place of urethra.

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[1] Recorded by Huxham and Oliver in Philosoph. Transact., Vol. XXXII., for years 1722, 1723, No. 379, p. 408–418.

the urine issued in numerous hair-like streams from the urachus-fistula, which was about nine inches long, as soon as the prolapsed uterus was replaced, and with it the bladder carried upwards. Oberteufer knew a woman forty-two years old, who had since birth only urinated through the navel. Vagina and menstruation was normal; the urethra was wanting.

If the persistent sinus uro-genitalis is large enough, coitus may be effected, and conception occur. But if the vagina is narrowed, the penis may penetrate the urethra, and each coitus be followed by dysuria and temporary incontinentia urinæ. Jumné (Heppner, l. c.) has described such a case. We must be careful not to mistake these cases for instances of hermaphroditism, as Smith did.

More than simple inspection is usually necessary for the diagnosis of malformations of the urethra. The inner surface of the labia minora and the space between the clitoris and the rectum must be carefully looked over, and then all orifices must be explored with the finger, or, where that is impossible, with elastic and metallic catheters and sounds. The external genitals should then be carefully palpated; and the existence of any hard resisting body is to be carefully searched for in the labia majora, since they might be testicles or ovaries. This is necessary, since in childhood we are not aided by the presence of menstruation or the female habitus. In the above-mentioned case of Debout, there was a hernia ovarialis sinistra.

A persistent uro-genital sinus may be mistaken for atresia hymenis, and acquired atresia vulvæ. In either case conjoined vesical and rectal examination will inform us whether there is a tumor or only a thin membranous septum between the two organs. If with finger, sound, or catheter, two openings can be demonstrated, the diagnosis is not difficult. If the entrance of the sinus uro-genitalis is very narrow, rapid dilatation with Simon's urethral specula may be tried, and an ocular examination made for another opening. Finally the secretion must be examined chemically for urea, and microscopically for pavement and cylindrical epithelium.

Treatment.—This may be palliative or radical. When there is complete absence of the urethra, and the bladder opens into the vagina by a fissure; and also when the urethra is partially developed and the sinus uro-genitalis persists, the construction of an artificial urinal canal might be attempted. From either side of the vagina, a flap about half an inch broad is to be stripped up to the symphysis, and, with its mucous surface turned in, is to be united above to the pared margins of the vesical cleft, and at the middle is to be united to its fellow of the opposite side. Heppner considers the operation difficult, but possible. It is doubtful, however, whether the possession of a urethra devoid of muscular fibres and incapable of voluntary contraction, would better the patient's condition. Nevertheless, the formation of the new channel would prevent the urine flowing into the vagina, and would facilitate retention and the application of a suitable receptacle. Lebedeff has successfully performed the operation.

On the other hand Heppner suggests the formation of an artificial urethra by means of a trocar-puncture into the bladder, and the subsequent closure of the fissure by suture. There is great danger by this proceeding of wounding important vessels, and the unavoidable contraction of the opening will cause retention, a far worse evil than incontinence of urine. Heppner disapproves of an operative reduction of the vesical fissure to the size of the normal urethra, since the anterior wall of the slit contains very probably no muscular structure, and our experience with patients with fistula teaches us that linear slits, even when of large calibre, retain urine better than do small circular openings. His patient suffered only from incontinence at night; he caused her to wear a bandage similar to the one Sawostitzki recommends. It consisted of an abdominal band, to which was attached a spring bearing an olive-sized pad. The pad, introduced into the vagina, compressed the posterior edge of the fissure against the symphysis; it fulfilled its purpose perfectly, and the patient soon became accustomed to it. Schatz's incontinence-pessaries might also be of use in these cases.

Operative procedure is of course our only resource in atresia urethræ. Cabral operated in 1550 on a servant at Beaucaire, who had had atresia from birth, and in whom the urine issued from a cocks-comb-like growth at the navel some two inches long, causing a frightful smell. He perforated in the region of the urethra, and tied the growths so that they dropped off in twelve days. Middleton had a girl seven days old who had never urinated, and whose abdomen was enormously swollen. He plunged a trocar in the direction of the urethra, emptied the bladder, and maintained the patency of the artificial passage. Oberteufer's patient wore a sponge fastened by a bandage over the fistula. In fact all the apparatuses which we shall describe in connection with urinary fistula, may be used in incontinence.

The abnormalities called epi- and anaspadia in women, are really vesical fissures, and will be considered under that head.

Duplexity is a rare developmental anomaly of the female urethra. The single undoubted example of it has been recorded by L. Fürst.[1] Fürst found in a preparation taken from the body of a virgin female, that the urethra, single at the bladder, at 1 line from it bifurcated, a thin septum running from right to left, dividing the canal. This septum grew thicker as he advanced forward, and the meati were over a line distant one from the other at the vestibulum vaginæ. The superior urethra also curved to the right, and the posterior one to the left. The left urethra had a meatus $\frac{1}{8}$th inch in diameter exactly in the median vaginal line, while the other meatus only measured $\frac{1}{12}$th of an inch. The total length of both urethræ was 1 inch. It is extremely rare for the duplexity of the first allantoic appendages to persist in this way, and not to undergo fusion during the various changes the sinus uro-genitalis passes through. Uterus and vagina were normally developed. In 1875 Lewis published a case in which a puerperal woman came under his observation, who besides a normally patent urethra, had one that ended in a blind sac. She is said to have undergone an operation for retention of urine immediately after birth, and one of these urethra is as probably an artificial product.

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[1] Archiv. für Gynäkologie.

CHAPTER VI.

ABNORMAL SHAPE AND POSITION OF THE FEMALE URETHRA.

DILATATIONS, strictures, diverticulæ, dislocations and prolapses of certain portions of the urethra are to be considered under this caption.

1. Abnormal dilatation of the urethra may affect its entire length, the surrounding tissues giving way upon all sides: Dilatatio urethræ totalis; or it may be limited to a portion of the canal, usually the central part, while the orificia externum and internum are of normal calibre; dilatatio partialis, diverticulum urethræ, urethrocele.

a. Total dilatation of the urethra is usually caused by the penis, in cases where the vagina is closed or is unusually narrow. I have seen it twice, and in both cases in married women, who had practiced coitus for years, but who suffered from atresia vaginæ with defectus uteri. With a little trouble the index finger could be introduced into the bladder. There were no erosions or lesions near the urethra, and both women could retain their urine perfectly. Scanzoni asserts that when dilatation is caused by the frequent introduction of a foreign body, the mucous membrane is the seat of a catarrhal inflammation, with more or less secretion. Hyrtl mentions a like case, which he believes to be unique. They are, however, not rare. Lachapelle has described one in a puella publica; Scanzoni one in a young girl who was in the habit during her daily acts of masturbation, to introduce a small wax candle 3 lines thick into the urethra; and Willemin (1864) one with defectus uteri and rudimentary vagina. In all these cases the forefinger could be passed through the urethra into the bladder. C. Knight (1860) has reported such a case; and Freund (1866) had a patient who practiced coitus for ten years per urethram, and never had incontinence, though she did suffer somewhat from ischuria at the beginning. Wegscheider has published a similar case. J. Säxinger has met a case in which a girl suffering from atresia vaginæ and hæmatometra had a urethra so dilated by coitus, that two fingers could be introduced into the bladder; yet incontinentia urinæ was not present.

The urethra may also be gradually dilated from within by new growths, or from the direction of the bladder or the vagina. Hyrtl's case is well known, in which a calculus 7 lines in diameter, escaped spontaneously from a woman's bladder. Scanzoni had a patient with stone in 1850 upon whom he intended to perform lithotrity; she was suddenly seized with severe bearing-down pains, and a calculus larger than a pigeon's egg appeared at the meatus, whence it was extracted with a polypus forceps. Here the urethra remained so dilated for several days, that the bladder could easily be reached with the finger. I myself had a case of papilloma of the bladder, who before the operation spontaneously evacuated a portion of the growth over 7 lines in diameter. Ponfick's case belongs also in this category; she had atresia vaginæ, hæmatometra, and cystitis with stone in the bladder; and her urethra was so dilated that various physicians mistook it for the vagina, and ascribed the incontinence from which she suffered to a supposed communication between the vagina and the bladder. With the lax, dilated, and displaced vagina caused by frequent child-bearing at short intervals, we usually find the urethra dilatable and enlarged, especially in young persons.

If total urethral dilatation does not give rise to incontinence, it causes no special trouble. Patients who have used the urethra for coitus, are naturally unaware of that fact, and consult the physician because they have never menstruated, or because they have no children. As a rule they suffer at most from a transient dysuria, and can generally fulfill their marital duties. It would, therefore, be useless to attempt to reduce the calibre of the urethra. It is different, however, when vesical continence is affected by total dilatation. Kinny claims to have cured three cases by cauterizations with chromic acid; but since I have not seen the original article, I cannot tell whether pure or diluted acid was used. Cauterization with solid lapis mitigatus would probably do as well. If, however, this is insufficient, I would recommend Jobert's urethrocele operation, which will be described later on. Astringent and tonic injections, and the sitz-bath, as well as scarification of the mucous membrane has been recommended; but Scanzoni reports that in an old case with relaxed genitals, all his efforts were in vain. He obtained most satisfaction from an ointment containing tannin or ergotin, to be applied partly to the vaginal walls, and partly in the urethra. In one of his cases, where the dilatation was caused by onanism, and resisted all methods of treatment, it yielded almost completely to injections of sulphate of copper. If all these means fail to restore continence, we must excise a strip 1 to 1½ inches long, from the urethro-vaginal septum from the external to near the internal opening. Its base in the vagina should be ⅜th in the urethra ⅛th of an inch broad. The edges of the wound should then be carefully sown together over a metallic catheter. The operation is easy, and its results are good. We will return to it when we come to consider incontinence and urinary fistulæ.

b. Partial dilatation of the female urethra, diverticulum urethræ, urethrocele, affects the posterior wall of the organ a few lines from the meatus. I know of but four cases so far recorded. The first, that of Foucher (1857), occurred in a woman twenty-seven years old, who had had dysuria for four years, and in whose anterior vaginal wall, ⅕ inch from the orificium urethræ, there was a tumor which became smaller on pressure, urine exuding from the meatus. On introduing a catheter, it entered this cavity, and only after traversing it attained the bladder. Foucher treated it as Jobert would a cystocele. He incised the vaginal wall the whole length of the tumor, dissected up a strip of ⅖th of an inch wide on either side, cut off the loosened portions, and sutured the edges of the wound. The patient was cured when cicatrisation had occurred. Gilette's case is very similar. A woman thirty-one years old, confined three times, was cured by the excision of a triangular piece from the vaginal wall.

The third case has been described by G. Simon. The woman was forty-four years old, had borne eleven children, and had had involuntary urination on vigorous motion for sixteen years. In the last three years the incontinence had so increased, that at certain times all her urine flowed off continuously in any position, even when lying down. In the anterior vaginal wall there was a tumor as large as a hen's egg, reaching from the region of the meatus urinarius to the vesical neck. The catheter or the finger introduced into the orifice entered a wide sac, which was continuous, without any line of demarcation, with the bladder. Only the meatus was normal in size, and had its proper muscular tonicity. This dilatation had been caused by large varicosities in the urethro-vaginal septum, which were so near to the urethral mucous membrane that a brisk hemorrhage followed catherization. They projected as dark blue coils. In two sittings Simon cut ten veins, double ligaturing four of them, and cauterized the wound with chloride of iron. The patient did not even have to keep to her bed. The tumor visibly diminished in size, through the cicatricial contraction of the wound. The woman no longer lost urine while lying, sitting and standing, and during ordinary motions. Six months later she had remained well, but Simon did not regard the relief as permanent, believing that the dilatations would reappear, or that other neighboring veins would become varicose. I have often seen considerable varicosities of the bulbus urethræ and of the anterior vaginal wall, but have never seen such a partial dilatation of the urethra result therefrom.

The fourth case was observed by Priestley. He found an elastic tumor, half the size of a hen's egg, in the vulva, springing from the upper part of the posterior vaginal wall; it disappeared on pressure, pus and urine flowing out of the meatus. Priestley applied a Barnes dilator, the pressure of which prevented the tumor from refilling, and relieved the patient.

In another similar case Priestley found a urethral cyst with atheromatous contents; a condition that might well be confounded with urethrocele. But in these cases the urethral canal will hardly be dilated, and the tumor will simply open into it. Since 1877 I have encountered two cases like these, which were indubitably affections of the urethral follicles. In the first the tumor was of the size of a walnut, was placed upon the lower part of the posterior urethral wall; pressure caused the appearance of pus at the meatus. The patient improved by frequent compression of the tumor with her finger, and a lead-water lotion. In the second case, however, the tumor, hazel-nut in size, was the source of great pain during cohabitation, and caused bearing-down feeling when the patient was standing. I therefore excised it. It was situated under the urethral mucous membrane, near the external orifice, and contained abundant greenish, slightly foul-smelling pus. Its walls were muscular, its inner surface being covered with pavement epithelium. These cases, I think are not urethroceles; they are cases of inflammation of urethral lacunæ. They have doubtless often been confounded with urethroceles and urethral cysts.

We must also remember that other openings may be found in an otherwise normal urethra, which must be distinguished from an urethrocele. Thus, as in the above-mentioned case of Debout, (page 29), the vagina may open into the urethra, so that a catheter introduced into the urethra may reach the uterus. Cusco has mentioned a case in which there was in the posterior urethral wall an opening $\frac{1}{25}$ of an inch in diameter, which led into a blind sac a few lines deep, the rudimentary vagina. Besides this, this servant girl, who was eighteen years old, had a uterus duplex rudimentarius solidus, and a hernia ovarialis simistra. Incarceration of the latter led to operation, and she died of peritonitis. Such adnexa may be dilated by the pressure of the urine, may deform and dilate the urethra, and may cause catarrh. Most often the differential diagnosis can hardly be made during life. Compression of the sac, as soon as it is proven that it has no other opening above, in the manner described by Foucher, will be our best method of examination.

2. Much rarer than dilatation of the urethra is narrowing, stenosis et strictura urethræ in women.

The causes are chiefly three; and they mark the three forms of the malady. First we have lesions of the urethro-vaginal septum, followed by cicatrization; they are seen chiefly after severe labors. Cicatricial bands are found at the vaginal entrance. Thus in Scanzoni's case (1858) there was a urethral stricture 4 to 5 lines from the meatus, which could be felt with the finger, as a cartilaginous prominence along the line of the urethra; it had been caused by a gangrenous colpitis after a forceps delivery. In Gayet's case an analogous injury caused a circular stricture at the ostium vaginæ, and there was so much callous tissue under the arch of the pubis, that the urethra was almost entirely closed. Ledetsch reports a similar case.

A tumor in the urethral wall is a much rarer cause. These may be phlebectasies, polypi, vascular or fibrous tumors.[1] They only obstruct the lumen when small, causing dilatation where they are more developed.

A still more rare cause of stricture of the female urethra is a urethral chancre. Scanzoni found such a one in a prostitute 5 lines from the meatus; it caused a stricture so close that only with difficulty could a crow-quill-sized sound be introduced into the bladder. Similar to this is the case of Velpeau and one of Larcher's (in his other three cases the cause was unknown.) Lewin found among 612 women treated at the Berlin Charité for pseudo-syphilis, 6 with urethral ulcerations, and 5 with ulcerations of the urethra and of the labia pudenda. Boucher found in a case that had long suffered from leucorrhœa and ulceration of the os uteri (though the record does not say whether she was specifically infected or not), two hardened and strictured places near the anterior mouth of the urethra, which could only be passed by the minute olive of a small bougie with considerable pain.

Stenoses of the urethra itself occur with chronic vesico-vaginal fistulæ. The passage is often so narrow as hardly to admit the smallest-sized bougies. Very lately I examined two patients with lesions of this kind. The vesico-vaginal fistulæ resulted in both cases from operative confinements, and the callous urethro-vaginal stenosis was such that only with the greatest of difficulty could a very fine sound be introduced.

Compression of the urethra in retroflexion of the uterus, by presenting parts during delivery, by hæmatocolpos or hæmatometra, etc., need not detain us; their results mainly affect the bladder, and will be considered under that head.

Like the causes, the symptoms of urethral strictures and stenoses are very various. Those due to vesico-vaginal fistulæ, simply render catheterization difficult. Those caused by cicatricial tissue obstruct urination; the stream becomes smaller, the bladder can only be emptied by a considerable exertion of the abdominal muscles, and finally the urine can only be voided in drops, and retention may occur. It is well known that in the female also hypertrophy of the bladder occurs under these circumstances. Scanzoni lays stress upon the deleterious influence exercised by hypertrophy of the bladder, following stricture upon the neighboring organs, the uterus and the vagina; he has often noticed descent of the anterior vaginal wall in consequence of it.

If we made a thorough examination of every patient that comes to us complaining of difficulty of urination; if we carefully examined the meatus and palpated the urethra from the vagina, and then introduced a catheter, following its advance with our finger in the vagina; it would be almost impossible to mistake stricture of the urethra for any other condition. The urine should then be carefully examined, since vesical catarrh and irritation may not only cause frequent desire to urination and dripping, but may hinder the entrance of a catheter by reflex contractions of the urethra and bladder. It must of course not be forgotten to examine per vaginam for a urethral tumor before passing the catheter, and if it is present, to push it if possible to one side during the operation.

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[1] See Th. David's case, Gaz. des Hôp., 73, 1870.

The *treatment* depends partly upon the cause. Stenoses due to vesico-vaginal fistulæ, and those due to œdema of the urethral mucous membrane, may be completely cured by repeated careful catheterizations.

If it be caused by cicatrices in the introitus and the vagina, we can follow Scanzoni and use lukewarm vaginal injections, followed by an iodide of potassium salve applied to the anterior vaginal wall, and by repeated introduction of bougies of gradually increasing sizes. Thus Goldschmidt almost entirely cured in four weeks a syphilitic urethral stricture by catheterization and the removal of a tumor that pressed on the external meatus. But in more serious cases this will not suffice. We must then carefully cut the chief cicatricial band at its point of greatest tension from without, and then undertake methodic urethral dilatation after Simon's method. (Page 13.)

For stricture caused by chancre Scanzoni used first a course of treatment with sublimate, and then for three weeks a daily inunction of iodine ointment, which was warmed and poured into the catheter, and then blown into the urethra by means of a syringe filled with air. The treatment was successful. Boucher's patient had been once completely cured in six weeks by means of gradual dilatation; but the strictures returned, and had to be redilated. In such cases incision together with dilatation is certainly indicated. The urethra should be dilated with the urethral specula, until the little finger could be passed through the stricture; then a short knife is to be introduced flat under the finger, and then returned and pressed against that part of the cicatricial ring that feels hardest. No especial hemorrhage need be anticipated; but if it did occur, the appropriate urethral speculum might be left for a few hours in the canal. Then bougies, medicated with iodide of potassium or salycilic acid, could be employed. The patient should be warned to return as soon as the least difficulty in urination occurred, or, if that be impracticable, she should use elastic bougies of gradually increasing sizes herself to prevent a recidive.

3. Change of position of the urethra, partial or total, may occur in any direction, above, below, sidewards, or anteriorly. Again the entire urethra, or only its mucous membrane, may be dislocated. This latter is the most important displacement, and will be first considered.

a. Prolapse of the urethral mucous membrane in females was accidentally found twice during autopsy by Morgagni nearly 100 years ago. Since then such cases have been seen by Seruin, Solingen, Hain, Lee, Kiwisch, Burns, Streubel, Ried, Scanzoni, Patron, Basler, Day, Hudson, Ingerslev, and Olivarius. It must be rare, since the author has seen but one case, though small partial protrusions of the mucous membranes of the lower part of the urethral wall occur often enough. The entire mucosa can only protrude at the external orifice where it has been loosened from its base and forcibly torn or pushed out. The protruded part is pea, walnut, or pigeon-egg-sized (Basler), bluish or dark red, and round, half-moon-shaped, or globular. At its middle or towards its upper border is the orifice of the canal. Thus the condition is exactly similar to that of prolapse of the rectum. As in the latter case the mucous membrane can usually be easily replaced; and like it also it may recede of itself, but in some cases may be difficult or impossible to reposit. The surface of the tumor sometimes bleeds, and may be sore and suppurating; in long-standing cases it grows and becomes œdematous and may appear constricted. (Patron's case.) It is usually very sensitive.

The causes of this malady are partly those of urethral dilatation (see ob. 5), partly diseases of the bladder, and partly constitutional affections. As a rule, the patients have already long suffered from urinary difficulties, dysuria, and vesical catarrh; and it is especially the catarrhal condition that predisposes the mucosa to a prolapse. In 15 sick persons suffering from this affection, were 7 girls between the ages of 8 and 15 years, weak, chlorotic, and relaxed individuals. Of Streubel's 4 patients three were "much used prostitutes with vaginal gonorrhœa, dilated meati urinarii and hyperæmic urethral mucous membranes." Displacement of the genitals, such as prolapsus uteri, cystocele vaginalis (Scanzoni), have repeatedly caused the affection. On the other hand there do occur cases like those of Basler, when a young women twenty-two years old had a urethra so dilated five weeks after her first and normal delivery, that he could introduce his finger, and bring to view a prolapse of the mucous membrane, the size of a pigeon's egg, the other genitals remaining normal. Exciting causes are contractions of the bladder with marked desire to urinate, expressing the mucous membrane; abdominal and vesical muscles here working together. It has been claimed that calculi may cause it (Scanzoni); I know of no such case. Solingen's one case had had a number of severe confinements, had suffered blows upon the abdomen, and in consequence thereof suffered from difficult urination and defœcation. Larger growths in the urethra cause prolapse of the mucus membrane, but usually only to a small degree.

Diagnosis.—To recognize that the little tumor between the labia minora and under the clitoris belongs to the urethra, and is not simply a tuberculum vagina, it is first necessary to find the urethral canal. In circular prolapses it is a slit or round opening in the middle of the tumor; in crescent-shaped ones it is situated at its upper margin. A catheter is now introduced and reposition attempted.

In a case published by Guersant in 1852 in which an emaciated and sickly girl had a prolapse of the mucous membrane nearly one inch in length cut away with the scissors, he found after her death, which occurred from tuberculosis, that her urethra, of normal length and diameter, was only covered with mucous membrane over its posterior (lower) third. This would go to prove that the meatus may occasionally be found at the lower portion of the tumor. Exactly defined the condition is not a simple prolapse, but is an invagination with prolapse. *Inversio cum prolapsu mucosæ urethra.*

The tumor and the difficulties it causes increase in time; and the protruded portion may be dry, smooth, soft, and undergo the change of the mucous membrane described in prolapsus vagina (Reid and Streubel). But this is rare, and the malady is painful, obstinate, and debilitating. The cure, though slow, is sure and radical, and the prognosis, therefore, not unfavorable.

Therapy.—We must first try to replace the part. It must be carefully compressed with three fingers, assisted by the well-oiled and blunt end of a thick catheter. After reposition the causes of the disorder must be remedied; such as vesical tenesmus, etc. It is a good plan to rinse out the bladder several times a day by means of Hegar's funnel, using a 1-1000 solution of salycilic acid. In the milder cases, when the prolapse remains reduced, involution of the mucous membrane and narrowing of the lumen of the urethra may be helped by the use of mildly caustic and astringent remedies, such as arg. nitrat., decoction of oak bark, sulphate of copper or zinc, tannin, etc. If the inverted portion is eroded or ulcerated we must proceed to more vigorous cauterization, and may use the lapis mitigatus in substance. Reposition must be effected immediately after each cauterization.

If in spite of this the prolapse returns, it has been proposed to treat it radically by ligature, the actual cautery, or ablation with subsequent application of chloride of iron. (Scanzoni.) We may discard the method of ligature over the metallic catheter, since it is slow and painful. The knife should be used. A large metallic catheter is carried into the bladder, fixed by an assistant, and a sharp hook inserted into the tumor on each side of the staff so as to prevent too great retraction of the mucous membrane. The mucous membrane is now dissected up from without inwards, beginning at the edge of the meatus, so that it can be cut off circularly. Scanzoni recommended the use of chloride of iron as a styptic. It seems to me to be easier and better to unite the cut edge of the mucous membrane to the edge of the wound at the meatus with a few silver ligatures. The stitches may remain in 5-6-7 days. There is no danger of pushing eschars caused by the caustics with the catheter into the bladder.

If serious hemorrhage is feared a wooden staff may be introduced into the urethra, and the prolapse taken off with the galvano-caustic wire.

b. Malplacement of the whole urethra is of more common occurrence than the partial dislocations that we have been so far considering, since it is usually secondary and unimportant, following changes in position of the bladder. Still, one primary dislocation of the female urethra alone may be cursorily mentioned here. We refer to its dislocation by the presenting part of the child, which bends the urethra at an acute angle. We then see it as a dark, bluish red tumor under the symphysis, together with the tuberculam vaginæ. Both the bending and the swelling of the vaginal and urethral walls are of importance in connection with retention of urine. Another and more frequent cause of this trouble is believed by Mattei and Ohlshausen to be the sudden descent of the uterus after delivery. The puerperal ischuria that occurs therefrom is exactly analogous to that so very often seen after the puncture of large ovarian tumors. The bend in the urethra forms an obstacle to catheterization which is very liable to be mistaken for vesical spasm. An attempt to force the catheter into the bladder may injure the urethral mucous membrane, and cause hemorrhage. But if the tuberculum vaginæ be first pushed up out of the way, and the catheter carefully introduced two or three times, the urethra will be sufficiently stretched to obviate the retention. But in all these changes of position, with or without changes in the bladder, the urethra is lengthened, and its walls may be thickened and infiltrated, or they may be atrophic. So that even in the later days of the puerperium there may be deficient contractility of urethra and incontinentia urinæ after such contusions. I had recently such a case, in which repeated cauterization of the urethral mucous membrane with solid lapis infernalis soon restored continence.

CHAPTER VII.

DISTURBANCES OF NUTRITION OF THE FEMALE URETHRA.

HYPERÆMIA, acute and chronic catarrh, ulceration and hypertrophy, hyperæmia urethræ, ulcera, hypertrophia urethræ, often occur in the female. But from the comparatively small area affected, they are neither symptomatically nor therapeutically as important as the corresponding affections in the male. These affections are often only stages of one and the same process, and we will therefore not treat them each one separately. Their etiology, symptoms and treatment are closely related.

The causes of these disturbances of nutrition lie either in the individual affected, or they come from without. Certain states of the urine may affect the urethral mucous membrane. A water rich in salts, or ammoniacal, one containing fungi, or rich in membranous threads (diphtheritis of the bladder) or one containing infected blood clots, may naturally cause hyperæmia, catarrh and ulceration of the mucous membrane. Diseases of the bladder and kidneys are, therefore, important predisposing causes of the affections that we are considering, especially as many of them necessitate introduction of the catheter, and possibly a direct lesion of the mucous membrane. The urethra often partakes of affections in its neighborhood, such as chronic and acute inflammations of the labia minora, catarrh of the vagina, and of the cervix. Thus urethritis has been found as a complication of the scrofulous diathesis, and with impetiginous skin eruptions, (Streubel); and specific catarrhal inflammation of the membrane has been seen in scarlatina and measles. Variolous pustules occur there in small-pox. Scanzoni found them twice. The same observer found in the urethra of a girl nineteen years old, dead of measles with acute disintegration of the blood, more than twenty follicular ulcers. Typhus, dysentery, and puerperal septicæmia often cause considerable nutritive disturbances in the walls of the urethra. There may spread from the labia minora and the introitus the ulcerations of syphilis, lupus, carcinoma, tuberculosis, diphtheria, and elephantiasis. Besides this it is well known that in pregnancy, in consequence of active and passive hyperæmia and mechanical displacement, the urethra is often affected; and it may be contused and even torn across in a non-instrumental delivery. Again, dislocations of the unimpregnated uterus, tumors of other pelvic organs or inflammatory conditions affecting them, and hemorrhoids, may involve the urethra to a greater or less degree.

The following external injuries may cause urethral diseases: lesions from cohabitation, especially in young women, catheterism, the attempt to introduce foreign bodies (masturbation), wounds from falls and blows, etc. It is easy to see that catarrhal conditions of the urethra may ensue from the use of unclean specula, or the careless employment of the finger, or compressed sponge, for dilatation of that canal.

Most frequently, however, these affections occur conjointly with maladies of the vagina, and especially together with virulent vaginal catarrh. Suchanek found in 166 cases the vagina and urethra both affected in 122, urethral gonorrhœa alone being present only in 3 cases. Hence we see that the virulent urethritis feminæ is usually secondary, and spreads from the mucous membrane of the introitus or the vagina; the urethra itself being usually too well protected to be directly infected.

Symptoms.—Under normal conditions the mucosa of the orificium externum urethræ is pale red in color. In conditions of hyperæmia it becomes rosy, cherry, or brownish red; the mucous membrane swells; and the canal per vaginam is felt to be warmer and thicker than usual. At first the amount of secretion is not increased. In urethral catarrh not only is the meatus reddened and the small glands swollen, but there appears a light mucous or muco-purulent fluid, often containing bubbles of air, which flows in considerable amount, as soon as pressure is applied to the urethra, from the orifice. From the non-dilated, healthy urethra no drops can be expressed; but in the catarrhal secretion of urethritis we find pavement epithelium, mucus and pus corpuscles, and vibriones. When ulceration has occurred we may find in addition according to circumstances connective tissue and elastic fibres (Bärensprung in chancre), and larger cells with nuclei (in lupoid ulcers) and multi-nucleated giant cells with detritus and blood-corpuscles (in epithelioma).

In gonorrhœa of women, urethral gonorrhœa proper, urethritis virulenta gonorrhœa, the mucous membrane is at first reddened; then the woman feels an itching, which soon becomes a prickling, burning pain, which is accompanied by frequent micturition and dysuria. A few (3 to 4) days later there appears a serous, sticky, albumen-like secretion, which in 6 to 8 days becomes purulent and greenish, in 20 days begins to decrease, and may have entirely disappeared in 30 to 40 days. (Boys de Loury.) Blood may be mixed with the secretion, hæmaturia and vesical catarrh may occur; but from the shortness of the female urethra, and the absence of the associated organs which are so prone to give trouble in the male, the symptoms are not usually violent. There is often seen around the meatus a number of vividly red projecting points, which are the infected and swollen orifices of the glands of the part. (Streubel.) This, as Scanzoni asserts, is a true folliculitis of the inner surface of the upper parts of the nymphæ. Occasionally these inflamed glands cause small abscesses, the affection spreads to the rest of the vulva, an abundant purulent and foul-smelling secretion appears, and finally the entire vulva is infected. With this there usually occur dysuria and strangury, the spastic contraction of the sphincter vesicæ causing the patient much trouble. The pain caused by urination leads the patient to retain her water as long as possible, and besides this, the urine flowing over the inflamed parts around the external urethral orifice causes violent itching and burning, often leading the patient to rub and scratch the affected parts violently. But rarely do abscesses of the vesico-vaginal septum occur. (See Cory's case.) Lewin has found that many women having urethritis and ulceration of the urethra suffer from an exudative erythema from reflex vasomotor stimulus.

If the process becomes chronic, the secretion decreases in amount, the redness diminishes, and the color of the parts becomes a livid blue. The entire canal is hard and infiltrated, though it is not painful. A sort of hypertrophia urethræ may gradually appear, the parts around the urethra, especially the anterior vaginal wall, being involved. Loosening of the mucous membrane leads to varicosities in it, and also to varicosities around the orificium externum; finally there may occur partial or total prolapse of the mucosa.

The diagnosis of hyperæmia and catarrhal or virulent urethritis, can only be made with the aid of sight. The labia minora are to be spread, all secretions carefully cleaned away, and the mucosa of the vulva and its neighborhood carefully inspected. Then the finger must be introduced into the vagina, and the urethral canal tested as to thickness, hardness, and sensibility. Pressure is then made upon it from before backwards, to express any fluid which may be in it. If urine has been recently voided, no fluid may be obtained, and some time must be permitted to elapse before pressure is again applied. The secretion thus obtained may be examined for gonococci with the microscope, to decide whether we have a simple or a virulent urethritis, or perchance a urethral chancre to deal with. Inoculation with virulent pus may cause virulent catarrh and soft sores, but a negative result does not prove the absence of the chancre. The proof of its existence must chiefly depend upon the demonstration of elastic fibres in the secretion; though small and frequent urethral hemorrhages, with obstinate œdematous swelling of the mucous membrane around the meatus, have been claimed as important data in the diagnosis of urethral chancre. (V. Bärensprung.) Swelling of the inguinal glands is important, and the occurrence of a bubo will help us in the diagnosis. Scanzoni claims as the seat of the acute hyperæmias and inflammations the lower and outer portions of the urethra, the inner and upper parts being the location of the chronic forms. On the other hand, C. A. Martin and Leger claim that the commonest seat of chronic urethritis is in the cryptis mucosis of the urethra and of the meatus urinarius.

Opinions differ much as to the occurrence of gonorrhœa in women. The syphilographers are authorities upon the matter, and we have already quoted Suchanek's figures. Boys de Loury and Costilhes also affirm that urethritis is not so uncommon as is thought. Ricord found it 8 times in 12 gonorrhœas; but Zeisl only 5 to 6 times in a hundred cases of vaginal blenorrhœa. Lewin states that in 242 blenorrhœic women only 8 had urethritis, and in 612 cases of female pseudo-syphilis only 11, =1.8 per cent. had urethral sores. Sigmund (Vienna) found in 1850 in 758 women urethral gonorrhœa occurring only 5 times alone, but 476 times with other catarrhs, etc. Thus it seems that gonorrhœa is common in prostitutes, and forms ⅔ of the total number of infected cases. Scanzoni remarks that chronic urethral catarrh especially is very often overlooked by gynecologists. Nevertheless I must agree with Hourmann, that urethritis occurs but seldom in comparison with vaginal and uterine catarrhs. In 425 cases of blenorrhœa Hourmann found a urethral flow but once.

The prognosis in hyperæmias, catarrhs and sores of the female urethra, is much better than it is in corresponding affections in the male. The canal is shorter and more accessible, the disability is less, and the chances of cure are more numerous. In some individuals the hyperæmia and the catarrh soon disappear when the cause that brought them on is removed. This is especially the case with the newly married, and in the cases that are connected with menstruation. Virulent catarrhs last 4 to 5 weeks. Boys de Loury twice saw a tight stricture following one. Streubel saw in neglected cases erosions, ulcerations, and that folliculitis to which we have above drawn attention. Knoblauch reckoned that the treatment of urethral gonorrhœa took 21.8 days. Energetic cauterization has caused it to disappear in 12 to 18 days. (Cullerier.)

Treatment.—There is yet considerable difference of opinion as to the results of various methods of treatment in hyperæmias and catarrhs of the female urethra. While Streubel, Boys de Loury, and Huet favor the use of balsams, opining that they render the urine bland more readily than in the male, and Boys and more recently Daffner claim that cubebs and balsam are just as efficacious as they are in man, Scanzoni obtained no results, and discarded them. The slighter cases of female urethral blenorrhœa need no treatment; they get well of themselves. Most recent authors rely entirely upon a local treatment for those that are more obstinate, only general dietary rules being prescribed. We begin by removing the cause, and ordering rest, abstinence from intercourse, and cool mucilaginous drinks. Milk of almonds, emulsions, and soft food are to be used. To relieve the burning and itching there should be given 2 to 4 vaginal injections of linseed tea daily, and lukewarm or cold sitz-baths containing decoction of white-oak bark should be taken. To further relieve the irritation and pain, we may use suppositories of cocao-butter or gelatine, or glycerine and starch, containing each extract of hyoscyamus 3 grs. or extract of belladonna gr. ⅓ or extract of meconium gr. $\frac{1}{10}$. Dr. Saxe (California) recommends rest in bed, hot applications to the feet, and hot drinks, to favor diaphoresis; he orders calomel and ipecac ⅜ to 3 grs. every two hours; he moves the bowels with decoction of senna, and gives light diet and mucilaginous drinks. As sedative he applies cold cloths to the vulva, and gives opiates. If there is no improvement in twelve hours, he orders saline purgatives.

If there is much hyperæmia, secretion and pain, cold applications, cold injections, and even the introduction of ice into the vagina is the next best thing to a narcotic. Scanzoni's advice to apply a few leeches to the part of the anterior vaginal wall corresponding to the urethra has received little attention from recent authorities, and has probably rightly been displaced by cold and local treatment of the affected mucous membrane. Hourmann accomplishes this latter object by first emptying the bladder, and then filling the urethra with a tampon of cotton 5 lines long, and the thickness of an ordinary catheter. By the repeated use of this method, he claims to have effected a cure in fourteen days. But Bois de Loury found that this procedure did no good at all in 10 cases, and that it was very troublesome, since it had to be renewed at least thrice daily. Streubel cauterized the mucosa, rolling the point of a waxen bougie in pulverized sulphate of copper, then dipping it in oil, introducing it 1⅛ inches into the urethra, and leaving it there for a few minutes.

Injections are less useful in the female than in the male, from the shortness of their canal, and their inability to retain the fluid.

To quickly cure marked hyperæmias or acute or chronic urethral gonorrhœas in women, our best remedy is the solid stick or the lapis mitigatus. It should correspond in size to the urethra, be rounded off in front, and should be drawn through the whole length of the canal two or three times. It is true it is very painful. In 3, 4 to 6 days the slough is cast off, and the process is to be repeated. Knoblauch saw a vesical hemorrhage follow this treatment which lasted 4 days, and was accompanied by ischuria; but no one else mentions any drawback. In very sensitive individuals bougies of mucilage, of tragacanth or butyrum cacao, containing iodoform or chinoidin, with astringents such as alum, zinc, and sulphate of copper (1:40-20), may be used. C. A. Martin recommends the application of a solution of nitrate of silver in an equal amount of water to the urethra by means of Clerc's caustic holder. Many authors, as Costilhes and Cullerier, use cubebs and copaiba internally, as well as external remedies. Huet uses colophonium soap. Colophonium has also been given dissolved in boiling soda, and made with some calcined magnesia in 3 grain pills, 15 to 30 to be taken daily. But I think we can usually do without any internal treatment. Besides a bland diet, tonics and quinine and iron for weakly individuals is all that is necessary.

If an abscess forms in the urethral wall, it should be incised from the vagina as soon as fluctuation is perceptible.

We have already mentioned inflammation of the lacunæ. Pawlik's case (*Wien. Med. Wochensch.* 1883, No. 25, 26) belongs here also.

CHAPTER VIII.

THE NEW GROWTHS OF THE FEMALE URETHRA.

THE urethra of the female is much more frequently the seat of new growths than is that of man. Attention was early directed to them, Morgagni describing some in 1719. But they excited universal attention when Clarke, in 1814, described their symptoms and importance, and designated them by the appropriate name of vascular tumors. It is true that since that time a number of growths have been included under this name; and though not by any means alike in structure or importance, they have either been called carunculæ (John Hunter), or spongy excrescences, or fleshy or varicose growths (Schützenberger), or cellulo-vascular tumors (Boivin-Dugès) or fungous excrescences (Kiwisch.) They should be divided into various groups in accordance with their structure. They almost without exception grow from the mucous membrane of the canal; and hence we may distinguish them as those in which the papillary bodies are especially involved, without much vascular hypertrophy, or condylomata; those in which the glands are diseased or enlarged, retention cysts, myxadenomata, mucoid polypi; those in which the chief disease is in the connective tissue, fibromata, and sarcomata; those formed by affections of the vessels, angiomata, varices, phlebectases; those in which papillæ and vessels together are involved, fungous or vascular tumors and polypi; papillary and polypoid angiomata, erectile tumors; and, finally, tumors originating in the epithelium, epitheliomata, carcinomata. With the exception of sarcoma and myxadenoma, Kiwisch had already distinguished these various tumors from one another. We will now proceed to a more detailed description.

a. The condylomata have a warty surface, are reddish or bluish-red, pedunculated, not sensitive, do not bleed readily, and project singly or in numbers from the orificium urethræ. They consist of a fibrous or homogeneous connective tissue, a capillary network, and a thin epithelial covering.

b. The retention cysts of the female urethra have lately been described by Englisch. They have been found in the fœtus at 6 to 7 months; in new-born girls they are seen at the anterior, in later years at the posterior portion of the urethral canal. They do not always project above the surface; sometimes their orifices only can be seen as a small black point. They are composed of a *substantia propria,* the inner surface being covered with pavement epithelium, and being papillated. If they are of large size, they may protrude as round tumors from the urethra, and may acquire a stalk and become polypoid. They are then usually covered with a normal mucous membrane.

c. If the connective tissue is especially involved, more solid tumors or fibromata, are formed; they have been described by Neudörfer, Mettenheimer, and Hennig. Neudörfer extirpated such a growth in a syphilitic woman, which was the size of a pigeon's egg, and which was composed of connective tissue with pyramidal processes, concerning the exact nature of which N. does not make himself very clear. The pedicle of the tumor was attached to the canal, near the orificium vesicale. Mettenheimer found the surface of the tumor he described covered with a thick layer of pavement epithelium, the stroma being a fibrillated connective tissue. Hennig relates two cases of congenital polypoid excrescences of the female urethra, one of which had a pedicle 1.2 inches and the other one line in length. Hardened in methylated spirit they showed a fine net-work of connective tissue. I myself have seen an exactly similar case, No. 544, 1876, in which in a newborn girl a cyst the size of a grain of corn hung from the meatus attached to a pedicle about 2 lines in length.

C. Ruge found in a tumor the size of a hazel nut extirpated by A. Martin (see Stechaw) a central mass of firm, vascular connective tissue. From this centre there projected numerous papillæ of two kinds, one being pointed, and the other broad and club-shaped. They were covered with pavement epithelium, the more superficial layers of which were composed of small flattened cells, while the deeper layers were composed of large, succulent and nucleated ones. Numerous nuclei were also present in the connective tissue.

These connective-tissue tumors are the largest neoplasms which occur in this locality. They may attain the size of a goose's egg (Velpeau, Scanzoni, Simon (Rostock). They are of rare occurrence.

d. A glandular and connective-tissue proliferation of the mucous membrane gives us the so-called myxadenoma, a case of which has been described and pictured by Biegel. The scarlet-colored, cherry-sized vascular tumor was composed of a loose-meshed myxomatous tissue which contained the remains of the degenerated glands.

e. Beigel has also described and figured the single case of sarcoma urethræ that is recorded. The tumor (T.) was walnut-sized, composed of thin lobes, and was attached to the outer border of the meatus (U.). (See Fig. 14.) The dense portions of the tumor showed a delicate stroma, the meshes of which were filled with very small cells. In the peripheral portions of the tumor, the tissue was looser, the meshes larger, and there were numerous spaces of varying size, filled with a colloid fluid. It was extirpated; but our author does not say whether it returned.

f. If there is much enlargement of the urethral veins, the varices may drag with them a portion of the urethral mucous membrane, and form tumors of considerable size, as we have already in G. Simon's case of prolapsus of the urethral mucous membrane. The growths are bluish-red, painless, and compressible, are covered with normal mucous membrane, and may be situated anywhere in the urethral canal. They are in fact true urethral hemorrhoids. Richet, who has lately studied urethral angiomata, and who claims to have seen 8 cases, lays special stress upon their resemblance to rectal hemorrhoids. They may, as in Simon's case, cause considerable hemorrhage on catheterization. If such a varix breaks without rupturing the mucous membrane that covers it, the blood is poured into the tissue of the tumor, and a hæmatoma polyposum urethræ is found. I have seen one such case, the history of which is as follows:

An old widow, sixty years of age, who had not menstruated for several years, had never had urinary difficulty, had had six easy confinements,

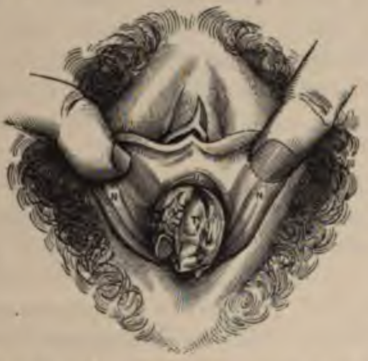

FIG. 14.—SARCOMA URETHRÆ. (After *Beigel.*)

her last pregnancy ending in abortion fifteen years ago, carried suspended to a yoke two heavy pailfuls of fluid on April 19th, 1867. While stepping across a narrow ditch, she suddenly felt a pain in the anterior portion of the vulva, followed immediately by involuntary emission of urine and some hemorrhage. The pain at the spot increased, and soon the patient noticed a tumor. On April 26th I saw her, and found the urethra dilated, and a walnut-sized, dark-blue, painless tumor projecting from it. Its surface was apparently fenestrated, but smooth, and it was attached by a thick pedicle to the posterior urethral wall. Judging by palpation, it seemed to be mainly composed of effused blood. In several places the mucous membrane covering it was necrotic. On April 29th in the clinic I applied the *écraseur* to the growth, the patient being narcotised. There was but little hemorrhage. A cotton plug was put into the vagina, so as to moderately compress the urethra. Urine was passed voluntarily, the patient soon recovered, and, when I saw her years later in Rostock, had had no recidive. Section of the tumor showed it to be composed of a coagulum covered with mucous membrane. The blood had hardened in layers, as in a placental polypus. No large vessels were to be seen.

Undoubtedly this was a case of ruptured urethral varix, since there was nothing abnormal save dilatation of the urethra and relaxation of its mucous membrane. The rupture was caused by the extra exertion of a long stride while carrying a heavy load. If I should have another such case, I should use the Paquélin cautery or the galvano-caustic wire, as A. Martin did; or I should use the knife, excise the mass, and suture the wound. This Martin has repeatedly done successfully with larger urethral tumors.

Besides these, venous angiomata and other vascular growths around and in the urethra have been described. Ch. Clarke, Ashburner, Rigby and Langier have described bulbous swellings of the urethra, some of which attained the size of a walnut. Pain, erectibility (Langier's case) and varicosity of the veins have been noticed. Virchow is of opinion that two conditions have here been confounded; that hemorrhoidal urethral tumors and congenital malformations have been classed together. The rudiments of the embryonal duplexity of the vagina sometimes undergo considerable development, and fall into a true telangiectatic condition.

g. But the most important of all urethral tumors are the so-called vascular tumors or polypi, or papillary polypous angiomata. These are new growths that vary from a pea to a hazel nut in size, and form pale cherry or raspberry colored tumors at the orificium urethræ. Their surface is usually granular; they may be more or less pedunculated, and they bleed readily. G. Simon found them microscopically composed of vascular loops, which had proliferated among the papillæ and the connective-tissue layers of the mucous membrane. Wedl also found enormously developed and tortuous vessels; he compared them to the vasa vorticosa of the choroidea, and designated them as dendritic papillary connective-tissue new growths with thin-walled vessels. "They are related to telangiectases, inasmuch as a very large number of vessels enter into their composition. But they differ in that the vascular wall is not thickened, and is not usually ectatic. The surface of the growth is covered with pavement epithelium; the basis is a soft mucoid or connective-tissue. Glands are infrequent; occasionally they are dilated or cystic, with mucoid contents." (Virchow.) Not all tumors of this kind are covered with pavement epithelium; Verneuil found one covered by a thick layer of cylindrical epithelium. Medoro long ago noticed that they occasionally increased in size, and were to be included in the class of erectile tumors, and Scanzoni has observed this in one of them during menstruation.

As a rule but one tumor is present; but 2 or 3, or even more, have been found. Besides this there occur, though not so frequently as West concludes, small similar excrescences in different parts of the vestibule. Simpson has given us an instructive drawing of such a case. West says that cases have been known in which almost the whole length of the urethra was the seat of these growths. These tumors being extremely sensitive, nerve-fibres have been sought in them; but Verneuil found none, though Dr. John Reid, according to Simpson, for whom he examined one, found "a very rich distribution of nervous filaments" in it. The most frequent seat of these neoplasms is near the orificium urethræ externum, on the posterior wall, a few lines from the entrance.

h. Lupoid and carcinomatous neoplasms are of extremely rare occurrence in the female urethra, and when they do occur, they have usually spread from the external genitals or the vagina. Rayan says that the meatus urinarius may be affected by cancerous and syphilitic disease. The descriptions of urethral carcinoma in the female, which we find scattered in the literature[1] are such as to render doubtful the correctness of the diagnosis. Though affection of the bladder is extremely common in carcinoma uteri, Gusserow finding it 128 times in 311 cases; though fistulæ are frequent, being present 56 times in the above 311 cases; it is very rare for any portion of the urinary apparatus save the trigonum colli and the posterior bladder wall to be involved. It is evident enough that death is close at hand by the time that perforation of the bladder occurs; and carcinoma of the external genitals is itself too rare to be frequent cause of the appearance of urethral cancer. Schlesinger has recently described a case of the latter kind, when a woman fifty-eight years old, who had long suffered from prolapsus uteri, had a long rounded tumor in the vulva 1 inch long, which extended from the root of the frænulum clitoridis down to the meatus. The urethra was shorter than usual, and its entire posterior wall was enclosed in a chestnut-sized tumor, which Klob decided to be a pavement-epithelium cancroid.

More recently 5 cases of peri-urethral carcinoma have been published; 4 by Melchiori and 1 by Riberi in 1869. These observers found that peri-urethral cancer in woman appeared as nodules in the vestibule near the urethra, and extended thence in the cellular tissue along the urethra, without, however, affecting the walls or the mucous membrane of the canal. Secondary ulceration of the meatus from extension of the growth, may however occur. The nodules are at first hard, painless, and non-ulcerating; in fact it is only the occurrence of occasional lancinating pains that leads to their discovery. They are often not noticed until they have grown to a considerable size and have ulcerated. Finally the entire vestibule is occupied by the new growth. In the earlier stage the cancerous nodules do not extend downwards to the depth of more than half the length of the urethra, about ½ an inch; in the second stage they reach the pelvic fascia and the neck of the bladder; in the third stage they extend over the symphysis and the rami descendentes pubis.

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[1] Brayne's case, in Busch's Geschlichtsleben, III., 26.

In Badenheuer's case the exulcerated tumor was the size of a hazel nut, embraced the orificium urethræ, and extended through the urethra to the bladder. In 1877 Thomas removed by galvano-cautery a pedunculated carcinoma of the urethra in a patient twenty-nine years old.

I myself chanced to see in July, 1878, in a single day, two very rare cases of primary urethral cancer, which I have described in my atlas. In the first case I extirpated the still isolated urethral tumor, and cured my patient. The growth removed was 1½ inches long, ⅗ of an inch thick, and contained in its mass the urethra with an ulcerated mucous membrane. In one place near the meatus, the vaginal mucous membrane showed a plain transition to the greyish-white, warty tumor mass. Solid plugs of pavement epithelium were divided from one another by bundles of muscular fibres. Towards the urethra breaking down had begun; and at the free surface, turned towards the lumen of the urethra, a brownish granular pigment lay upon the degenerated cancroidal processes. The tumor was separated from the vaginal epithelium by the vaginal mucosa, which was normal save for the existence of a large number of leucocytes. Only in the neighborhood of the anterior portion of the urethra could any participation of the vaginal epithelium in the growth be noticed. There its lower surface showed deep inter-papillary depressions, some forked; and many were only separated by a narrow strip of connective tissue from the neighboring cancroidal processes. The patient was fifty-eight years old, and had been delivered naturally eight times.

The second case is shown in Fig. 15. In both cases a pavement epithelioma had undoubtedly started from the urethral mucosa. In the second patient, who had urethral and vesical calculi, and soon died of uræmia, the pelvic connective tisssue contained no cancerous nodules; there was present a fistula urethro-vaginalis carcinomatosa as well as secondary carcinoma vesicæ.

I have seen one case of lupus perforans vulvæ, in which a hole was eaten through the right labium minus; and another in which the disease extended from the base of the clitoris to the urethra, whose wall was much swollen and was filled with nodular thickenings and condyloma-like growths of the mucous membrane. The latter case had obstinately withstood all manner of anti syphilitic treatment for years, and the urethra was much dilated.

L. Mayer has seen destruction of the urethra from elephantiasis of the vulva. (L. c. case 9.)

Symptoms.—Many of the new growths that we have described may exist without causing a single symptom save a slight burning. This is apt to be the case with small condylomata, fibromata, retention cysts, and mucoid polypi. If they grow to any size, besides the pain caused by their traction, a disturbance in the excretion of urine is the first symptom that attracts attention. The patients feel an itching and burning in the urethra, together with frequent desire to micturate, and dysuria. The symptoms may become very marked. Simpson tells of a woman having a vascular tumor of the urethra, who, when she desired to urinate, used to leave the house, so that she could groan and cry out undisturbed. He also mentions the case of a girl sixteen years old, who retained her urine twelve hours so as to avoid the frightful pain. As the growths enlarge, the urethra is dilated, and its mucosa becomes irritated, hyperæmic, and catarrhally inflamed. Thereupon follow erosions, fissures, and sores. The pains now radiate to hips, back, and thighs, even to the feet; they are increased by standing, by motion, and sometimes by menstruation. In spite of the urethral dilatation the stream of urine is often very small, or it may be forked; often the urine is tinged with blood.

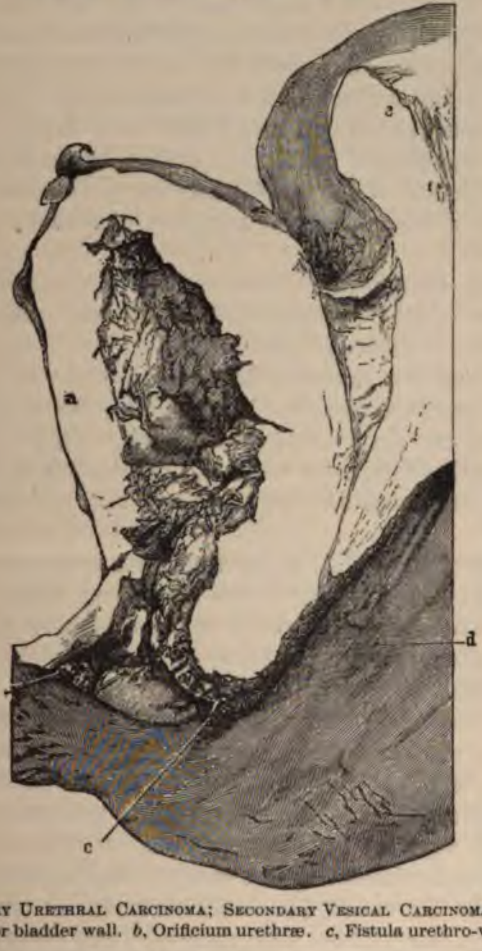

FIG. 15.—PRIMARY URETHRAL CARCINOMA; SECONDARY VESICAL CARCINOMA; URETHRO-VAGINAL FISTULA. *a*, Anterior bladder wall. *b*, Orificium urethræ. *c*, Fistula urethro-vaginalis. *d*, Vagina. *e*, Cavum uteri.

If the tumors occur in little girls, the troublesome itching may drive them to masturbation. Reid says that varicosities of the urethra increase the sexual desire, though its satisfaction almost invariably causes pain. In fact the polypoid angiomata of the urethra usually render cohabitation impossible from their pain, since the slightest touch of the finger, and even that of the chemise, causes excessive pain, and leads to a spasmodic contraction of the sphincter cunei and levator ani, which renders admissio penis impossible, and produces sterility as certainly as does vaginismus. Nevertheless such tumors have been found in pregnant women.

Later on the pains may be so great as to lead to convulsive attacks, and to insomnia; while the catarrh and hemorrhage have a very deleterious influence upon the general condition. In consequence of the retention of urine, inflammation of the bladder and the ureters and kidney disease may ensue. This, though happily rare, has happened (Medoro, Bardenheuer.)

The following complications deserve mention: uterine and vaginal catarrh, vaginal polypi (Macdonnell), polypi of the vestibule (Simpson), and calculi in the bladder and the urethra.

Besides the tendency to continuous growth, there is, especially in the angiomata, a great predisposition to a return. After extirpation these latter usually appear again in 1½ to 2 months. This has been observed by almost all authorities, even when the application of ferrum candens and energetic cauterization has followed the operation. (Kiwisch, Medoro.)

One symptom of the malady which I have had an opportunity to observe for years at a time, and which is not mentioned by any author that I know of, is the hyperæsthesiæ vulvæ in the neighborhood of the tumor, which render sitting almost absolutely impossible to the patient. I had one case in which the tumor was repeatedly removed by me with the scissors, and followed by energetic cauterization with nitrate of silver. But the malady was occasioned by a myoma of the posterior uterine wall, dislocating the organ, so that it pressed upon the neck of the bladder; and it always grew again. This patient could not possibly sit on a chair in the ordinary way; she only sat upon one tuber ischii, and had been engaged for years in attempting to arrange a chair to fit herself. Finally she spent nearly the entire day either standing, or lying upon a sofa. She could not go into society, since she could only sit upon the edge of a chair for a few minutes at the most; and she always eat standing. Coitus was absolutely impossible; she was nearly sixty years old, and though married thirty years, still virgin. She could not on account of her advanced age make up her mind to undergo an application of ferrum candens under narcosis; and the only relief she could obtain was always gotten by cauterization of the flat tumor with nitrate of silver or the lapis mitigatus.

Diagnosis.—Ocular inspection of the meatus is never to be neglected when women complain of painful micturition, of frequent desire to urinate, of pain on sitting, or of any irregularity in making water. Any tumors of the urethra, if present, will then be seen. Condylomata will be recognized by their painlessness, by their bluish-grey, cauliflower surface, which does not bleed when touched, etc.; and usually analogous growths will be found in other portions of the vestibule to confirm the diagnosis. Fibromata and cysts are painless, have a smooth surface, and are elastic; varices are bluish and compressible, and usually very sensitive. Sarcomata and angiomata are excessively painful, of a brilliant red color, and characteristically bleed when touched. They could only be mistaken for vaginismus if inspection or palpation of the parts has been imperfectly accomplished; for in that disease the hymen or its remains are usually so sensitive that the mere attempt to introduce the finger causes severe spasm, while with urethral angioma an examination can be quite freely made if only the meatus be avoided. Only in cases where these tumors lie hidden within the canal can a mistake be made. In sensitive patients narcosis is required for the recognition of growths in the upper part of the urethra; vaginal pressure will then usually cause the tumor to appear, or it may be dragged out with a pair of forceps. If this does not suffice to render the diagnosis clear, the urethra must be dilated, either with Espezel's instrument, shaped like an ear speculum, or with Simon's specula. There is some danger of confounding some of these tumors with prolapse of the urethral mucous membrane (see page 38); but it may be avoided by carefully noting the position and shape of the meatus, and by endeavoring to reposit the tumor, finding out whether it is sessile or not. Of course a tumor and a prolapse may coexist.

The want of proper ocular inspection often causes non-recognition of the malady upon the part of the physician; other trouble, or the radiating pains of so many uterine affections, may be supposed to explain the symptoms. A very exact examination of the affected part ought to render a mistake in diagnosis impossible.

Etiology.—The neoplasmata of the urethra occur at all ages. Englisch, Hennig, and I have found them in young children, and at birth. Mettenheimer has seen them in a girl 6 years old, and Denucé in 4 girls from 7 to 13 years. West records one case under 20, 5 between 20 and 30, 6 between 30 and 40, 4 between 40 and 50, and 5 over 50; and I have had one at 60, one at 70, and one at 92 years.

The small number of cases renders it impossible to say whether single or married women are more prone to them. Besides the above recorded cases of congenital urethral polypus, I have seen 20 cases of urethral neoplasm; all but one of these were in married women, and the one exception had had a child; 5 were sterile, and 5 had been 5 times confined. Scanzoni remarked that, as a general thing, other affections of the genital apparatus were present at the same time as these tumors; he found only

2 out of 13 cases in which this was not the fact, and I found it to be so in every one of mine. But Scanzoni went further. Since in almost every case there was some chronic catarrh of the urethral mucous membrane, he claimed that this catarrh was the etiological moment of the new growths. My experience is opposed to this. Velpeau also thought that syphilitic-(more correctly gonorrhœal) infection was their most frequent cause, and Schützenberger and Kiwisch agree with him. But Simon, Normann, Streubel, and I believe that as a rule (with the exception of course of the condylomata), the new growths are not the result of infection, and the mucoid flow from the urethra occurs simply in consequence of their presence. The same holds true of masturbation; it is just as likely to be an effect as a cause. (Englisch, Normann, against Mettenheimer.)

There can hardly be any doubt that catarrh of the vagina may lead to urethral catarrh, and may thus be the cause of certain new growths. Nor is it difficult to understand that cohabitation, pregnancy, childbed, and the puerperal state, causing frequently, as they do, urethral lesions, are predisposing causes of these affections. This Richet has especially emphasized for venous angiomata. Both my cases of primary urethral carcinoma occurred in multiparæ (8 and 9 pregnancies respectively) aged thirty-six and fifty-eight years, and without any history of heredity. Winiwarther did not find a single case of urethral affection among 258 cancerous women. In rarer cases tumors of the uterus, ovaries, and other pelvic organs cause these neoplasms by the active and passive hyperæmia they set up. Verneuil observed a case of uterine fibroid, and in the same category belongs the case that I have described. The patient was ninety-two years old, and had hæmatometra senilis. Old, relaxed, and scrofulous individuals with phlebectasies of the genitals are predisposed to urethral tumors.

If gonorrhœal affections were really the most important causes, men, who rarely suffer from these new growths, should have them very often. Virchow here cites Goulard, already mentioned by Morgagni, as his authority. More recently Plum found a vascular polyp in the male urethra.[1] In A. Martin's (Stechow) second case gonorrhœa was said to be the cause.

It is especially in regard to etiology that the above-mentioned case of Neudörfer is of interest. There was hypertrophy of the clitoris and of its prepuce, and below that the five pyramidal projections from the urethra. It is possible that the latter might be due to the permanent irritation caused by the former.

Hutchinson's published case of a polypoid papillary angioma in a woman of thirty-three, who belonged to a family of bleeders, is of interest here. There was undoubtedly in this case a hereditary predisposition; but nevertheless most new growths are due to local irritation. And we are by no means agreed as to which kind of irritation is the most frequent agent. The exact etiology is not very clear. Biegel claims that there are but few women who are not affected with one or other of the growths under consideration. I have not found them so frequently. Hypertrophy of the lower portion of the urethra is extremely common in women; but true tumors are not of everyday occurrence. In 2700 puerperal women, whom I carefully examined myself at the time of discharge, I found 493 or 18 per cent. with erosions, fissures, or cicatrices in the immediate neighborhood of the urethra; but only 18 showed varices, pointed condylomata, or small polypi of the urethra. Prolapse of the urethral mucosa was present, however, in 10 per cent. of all cases.

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[1] Virchow-Hirsch, Bericht, f. 1870, II., 197.

Course and Prognosis.—Most neoplasms of the female urethra, as condylomata, fibromata, mucous membrane polypi, and cysts can be easily and safely extirpated; they cause but little trouble, and their prognosis is good. Occasionally, as Spalderer has noticed, the polypi pass off spontaneously with the urine, their bases having necrosed. On the other hand the venous and capillary angiomata not only cause numerous and very painful symptoms, but they also show a very great tendency to return, and their prognosis is not nearly so good. It is true that operative removal is an easy affair; the hemorrhage is usually unimportant; but they begin to grow again in six or eight weeks, and the hemorrhage during and after the operations, both externally (Biegel) and into the bladder (Lisfranc-Forget) does impair the patient's strength. And there are cases in which the patient's life is imbittered and endangered by every new return of the malady, in spite of the most energetically radical treatment. Happily, these cases are the exceptional ones; and, save as regards the lupous, elephantiatic, and carcinomatous growths, a radical cure can be effected within a short time.

Therapy.—If the urethral tumor causes no trouble, there is no reason to interfere with it; but if it causes uneasiness, pain, or disturbance of function, energetic and speedy action should be taken. The following methods of removal have been employed:

1. The ligature: Guersant, Reid, Guérin.
2. Extorsion: Streubel.
3. Ablation with knife or scissors: Velpeau, Schützenberger, Espezel, Forget, Kiwisch, Normann, Simpson, Englisch, Reid, Macdonnell, Neudörfer, and others.
4. Ferrum candens: Medow, Lee, Dalamin, Retzius, Simpson.
5. Excision and energetic cauterization of the base with arg. nitrat. or lapis mitigatus, or acid. nitr. or ferrum candens, or the galvano-cautery: Velpeau, Macdonnell, Reid, Wetzer, Schuh, Thore, Bérard, Simpson, Guérin, Veit, West, Baker-Brown, Ménétrez.
6. Severe cauterization alone, with arg. nitrat. in substance, with concentrated sulphuric acid: Graem, with chromic acid: Edis.

In the larger and more deeply situated ones the urethra has been incised before extirpation; Warner, Schuh, Wetzer, Macdonnell.

According to the most recent authorities No. 5 is the best of these methods; No. 1 (ligature), and No. 2 (torsion), being obsolete. The patient is deeply narcotized and placed in the dorsal position. The assistants exposing the urethral orifice fully, the tumor is to be drawn forward with a tenaculum, and cut off at its base with knife or scissors. The base is then cauterized thoroughly for several seconds with ac. nitr. concentr., or ac. chromic, or with a small, pointed, red-hot iron. The bleeding is usually inconsiderable; if it is too free the repeated application of the ferrum candens, or the use of the liquor ferri sesquichlorati will stop it, or pressure may be made upon the urethra from the vagina first with the finger and then with tampons. If the tumor be situated high up in the urethra, and cannot be dragged down to the meatus, the urethra may be dilated; if it still cannot be drawn out, the galvanocaustic wire must be passed around its base. If the prominences in the urethra should be so flat as not to be seizable by the wire, we can dilate the urethra, and use Simon's spoon to curette them.

In the retention-cysts of young children the use of bougies and catheters would necessarily precede excision.

In hemorrhoidal tumors of the urethra dilatation by the dilatator urethra or by tampon is indicated. If this method involves too much trouble and pain, the tumor may be drawn down, the veins tied off, and the tumor excised. Finally, the actual cautery, or the galvano-caustic wire may be used to remove them. Richet has cured them by the use of a dilatator, shaped like the Frére-Come lithotome.

Finally, in epitheliomata of the urethra caustics are always contra-indicated. Bardenheur used the sharp spoon upon his patient. Excision is the best remedy, so long as the tumor is small and isolated.

Melchiori has even operated in the second and third stages, to ease the patient's sufferings. He made a sickle-shaped cross-cut, with its convexity directed upwards, separated the soft parts with the exclusion of the urethra, and, after severing all adhesions, drew down the tumor. He then cut through the exposed urethra at the place fixed upon, closed every spurting artery by ligature or torsion, and stilled the oozing by means of ice-water and styptic solutions. Only when the bleeding was obstinate did he use catheter and tampons; and he removed them at latest in 24 hours. Healing took place by the contraction of the neighboring soft parts around the urethral stump, so that finally only traces of a vestibule were left. Incontinence is not to be feared so long as the neck of the bladder is not injured; and thorough cleanliness will prevent any difficulty with the urine. If operative treatment is no longer possible, a symptomatic treatment of the pain, dysuria, and foul odor, by means of narcotics, catheterism, and antiseptics must be carried out. In the extirpation of a urethral carcinoma the size of a walnut I passed a catheter into the bladder, and then passed three needles from the vaginal mucosa under the catheter, drew them together with strong thread, and dissected out the urethra underneath them. Five bleeding arteries were tied with catgut, and then the urethral mucous membrane was united to the edge of the wound by means of seven deep-seated silk sutures. The catheter was left for several days in the bladder. Primary union took place rapidly.

Internal remedies have never effected anything in the maladies that we are considering; and even the local palliative treatment, such as dilute hydrocyanic acid (1:4), aconite, chloroform, and morphine in salve form, and warm sitz-baths (Simpson), have given no relief.

To prevent a recidive, energetic cauterizations every 3 to 4 days are to be recommended. We may use undiluted lig. plumbi. (West), liquor hydrargyri nitrici (Veit), argentum nitricum in substance, zincum muriaticum (Mettenheimer); but better than any is the actual cautery.

CHAPTER IX.

NEURALGIAS OF THE FEMALE URETHRA.

URETHRALGIA and spasmodic contraction of the urinary canal are usually only symptoms of one or other of the affections already described, and are especially apt to occur with displacements, hyperæmias, catarrhs, ulcerations, and new growths. They were formerly considered independent affections more frequently than is really the case, perhaps because the pain and spasm occasioned by catheterization was referred to the nerves in default of a more exact diagnosis. Ohlshausen believes that both Scanzoni and I confounded the angular bending of the urethra caused by the descent of the pregnant uterus with spasm of the organ. This may be the case. But it is hardly to be doubted that the female urethral mucous membrane does occasionally show hypersensibility without demonstrable organic disease; and also that after very careful introduction of the catheter, and, as Scanzoni has observed, after cohabitation in the newly-married, the urethra does sometimes become the seat of a painful spasmodic contraction. So also certain states of the urine may affect the urethral mucous membrane and cause spasm, exactly as it occasionally does in men after drinking sour wines or beers, or an exposure to cold. But, of course, local irritations will always remain the most important cause of such hyperæsthesias. A most thorough local examination, if necessary with dilatation and palpation and inspection of the urethral mucous membrane, must be undertaken. The diagnosis of a pure neurosis should not be lightly made.

Neuralgia can only be diagnosticated when none of the affections which we have previously described as causing abnormal sensations and spasmodic contractions of the organ are present. Locally we can use lukewarm or warm sitz-baths, vaginal injections of hot water, suppositories of cocao butter with extr. belladonnæ (gr. iv.—℥ i) or ext. hyoscyam. (gr. x—℥ i), or morphine, (gr. ii—℥ i). Besides this, bougies with extr. opii or morphine may be placed in the urethra, or rectal injections of linseed tea (℥ ii with 10 to 20 drops of tra. thebaica) given to relieve the pain. A solution of chloral (1 to 50) has been used per rectum for the same purpose.

If the urine irritates very much, mucilaginous drinks or camomile or orange blossom teas may be drank. It is useful also to give hourly teaspoonful doses containing extr. hyoscyam gr. j. or extr. opii gr. ⅛ to ¼ in emulsio amygdalina. Lupulin, with or without opium, 3 to 4½ grs. taken several times a day, and the tincture of cannabis indica 10 to 15 drops F.S. are to be recommended. The new local anæsthetic cocain ought to do good service in these cases; it should be applied to the mucous membrane with a brush.

CHAPTER X.

FOREIGN BODIES IN THE FEMALE URETHRA.

THE foreign bodies found in the female urethra may, like those of the bladder, either originate within the body, or be introduced from without. To the former category belong portions of the contents of the intestine, gallstones, renal calculi and portions of the kidney substance, echinococcus cysts, vesical calculi and fragments of the wall of the bladder, hair, bones, and teeth derived from the ovaries. In the latter class articles of various kinds have been found, as catheters, hairpins, pins, bits of wood, etc., etc. These become impacted in the urethra either on account of their size or because they have been introduced in a direction that has caused them to penetrate the walls of the canal. If a foreign body coming from the bladder is too large to pass, dysuria, strangury or anuria soon manifest themselves. Thus in v. Faber's case[1] there was excessive desire to urinate, with the emission every 5 to 10 minutes of a few drops of clear, yellow urine; after several hours, however, about 1½ lbs. of urine was suddenly voided, in which was found a bunch of hair 1 to 1½ inches long and about as thick as a stout pen-holder, which was twisted into a plug, and corresponded to the patient's urethra both in size and shape. Undoubtedly the hair had come from a dermoid cyst of the ovary which had penetrated the bladder.

Scanzoni's case, to which we have before referred, shows how vesical calculi may become impacted in the urethra. Amand removed from the urethra of a puerperal woman an olive-shaped fleshy mass containing 15 stones of various sizes.

If the foreign body comes from without and penetrates the wall of the urethra, it may cause local inflammation and abscess, or it may lead to the formation of a calculus in the urethra itself. Of this kind is the case that Magario has recorded, where a woman 22 years old retained a needle in her urethra for a long time until it eventually penetrated into the vagina. Around it a concretion 3 inches long and 4 inches and 3 lines in circumference had formed, which could be felt for several lines through an opening in the urethro-vaginal septum. Micturition was dribbling, and occasioned much pain, although the urethra was greatly dilated; and cohabitation always hurt her. The stone was removed by vaginal incision and the patient was cured. Portions of papillomata of the bladder-wall may occasionally plug the urethra, but their softness usually causes them to give way under the pressure of the urine. This is also the case with blood clots from vesical hemorrhage.

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[1] Deutsche Klinik, 52, 1857.

Finally, in very rare cases a urethral foreign body may arise from the formation of a calculus or the growth of a neoplasm therein. This occurred in our second case of urethral carcinoma; and in a cysto- or urethrocele the urinary salts may be precipitated and form concrements. In Giraud's case it was probably the kick in the perineum which caused inflammation of a urethral lacuna with the subsequent formation of a stone. The calculi sometimes found in these lacunæ cannot be considered extra-urethral.

The existence of a foreign body in this situation may be ascertained by inspection, when it lies near the meatus urinarius, or by vaginal touch and the urethral sound.

If the foreign body comes from the bladder, and is too large to pass out, the urethra may be dilated, and its extraction essayed with the forceps. If this does not succeed, it may be carefully pushed back into the bladder, crushed with the lithotrite, and the fragments extracted. If the body cannot be dislodged, a sufficient vaginal incision is to be made longitudinally into the urethra, extraction effected, and the wound immediately closed with silk or metallic sutures. It heals without difficulty.

Foreign bodies that come from without are to be seized with the toothed forceps and extracted in the direction in which they entered, if necessary previously dilating the urethra. In most cases this latter procedure will be necessary to find out whether small fragments of the body have not reached the bladder, and if so, to immediately take them out.

PART II.

DEFORMITIES AND DISEASES OF THE FEMALE BLADDER.

CHAPTER XI.

DEVELOPMENTAL DEFORMITIES OF THE BLADDER.

ANATOMICAL CONDITION.—By far the most frequent and important developmental deformity of the female bladder is vesical fissure, which depends upon a more or less extensive deficiency of the anterior vesical wall, and usually occurs in conjunction with abnormalities of neighboring organs. The navel as well as the anus is usually nearer the symphysis. The malformation occurs in various grades. There may simply be a cleft in the most dependent portion of the bladder; so that Desault, Paletta, Coates and Gosselin saw cases in which under the relaxed but not open symphysis there was a fissure ⅗ of an inch long. The clitoris may be cleft: (Fissura vesicæ inferior; Fig. 16.) In a more marked case, where the lower part of the abdominal cavity and the pelvis is normal, and the external genitals, urethra, and the lower half of the bladder in their usual condition, the cleft is higher up, near the navel: (Fissura vesicæ superior; Fig. 17.) Closely related to this latter is patency of the urachus: (Fistula vesico-umbilicalis.) It may be open throughout its entire length, and open externally at the navel ring. Finally, in the highest grade of fissure of the bladder the entire anterior vesical wall seems to be absent. The lower abdominal region is usually shortened, the navel being approximated to the pelvis; the abdominal wall is cleft, and the gap is filled with a swollen red mucous membrane which is continuous with the external skin at the edge of the orifice. The mucosa of the bladder is wrinkled, thickened, moist, and shining; its edges may be dry and covered with a thick layer of epidermis. At the lower end of the bladder is the urethral orifice. The pubic arch is never completely closed; the imperfectly developed pubic bones are ½ to 3 inches apart, and are only connected by a fibrous band. This diastasis of the pubis is found even in the new-born, as Dubois, Dupuytren, Mery, and Littré have shown. The urethra is usually entirely absent. The clitoris is bifurcated, each part being situated above the atrophied labium majus of that side, or it may be entirely absent. Below this is the hymen, with a vagina, or perhaps unperforated. The vagina may be absent, as in Herder's and Eschenbach's cases, or it may be, like the uterus, divided by a septum. Atresia of the vagina and imperfectly developed ovaries also occur with this, the most advanced form of vesical fissure. It may be called "eversia" or "extrophia vesicæ." Occasionally the posterior bladder wall prolapses through the anterior opening, giving us inversio

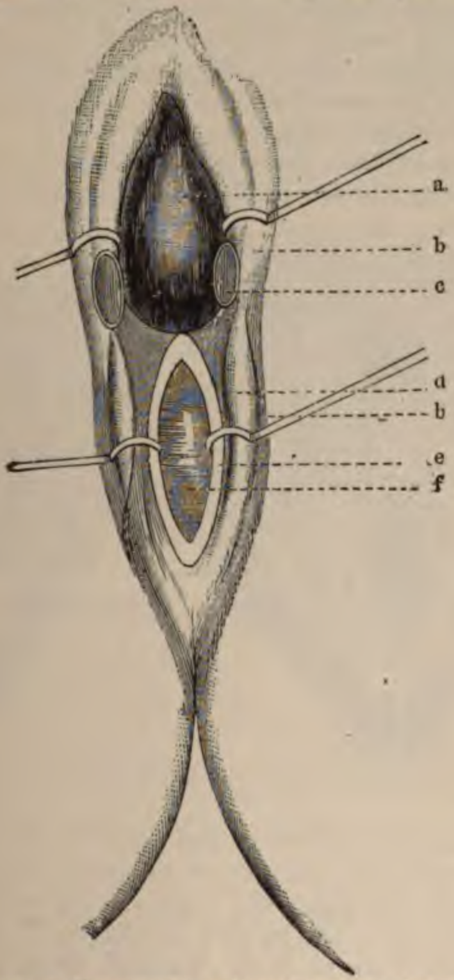

FIG. 16.—EPISPADIA. (After *Kleinwächter*). *a*, Vesical fissure. *b*, Lab. majus. *c*, Clitoris. *d*, Lab. minus. *e*, Hymen. *f*, Introitus vaginæ.

vesicæ cum prolapsu per fissuram, which is to be distinguished from inv. v. c. prol. per urethram and i. v. c. p. per urachum, to be described later. As a rule they are much dilated, and can easily be found with the sound; Isenflamm found them dilated to 9½ and 14 lines, Petit to 2 inches, Flajani and Baille to 4 inches, Desault to 3 inches, and Littré to 2½ inches with small calculi in them. Their course is usually altered, lying very deep in the pelvis, and then ascending to the bladder. But they are not always dilated. Bann in 1818 found them of normal length and diameter, and I have myself seen a case (l.c.) in which neither they nor the kidneys showed any change.

The six cases of Roser, Gosselin, Kleinedächer, Möller, Möricke, and Frommel are very rare and peculiar varieties of female epispadias. The external genitals, clitoris, frenum, and prepuce, were cleft, and between them was a deep furrow which led to an opening in the anterior vaginal wall behind the introitus. The urethra was absent or very defective. In Möller's case[1] there was an oval opening which stretched from the navel to the arch of the pubis, the muscular tissue, fascia transversalis, and peritoneum being intact; the clitoris was split, and the fissure extended down to the anus. The pelvis was split; the urethra was short and wide, and opened into a very small bladder. In the case of Frommel's the anterior urethral wall was absent save a piece about $\frac{3}{16}$ inch long, and the posterior wall was occupied by a vividly red tuberculated mucous membrane. The pelvis was normal.

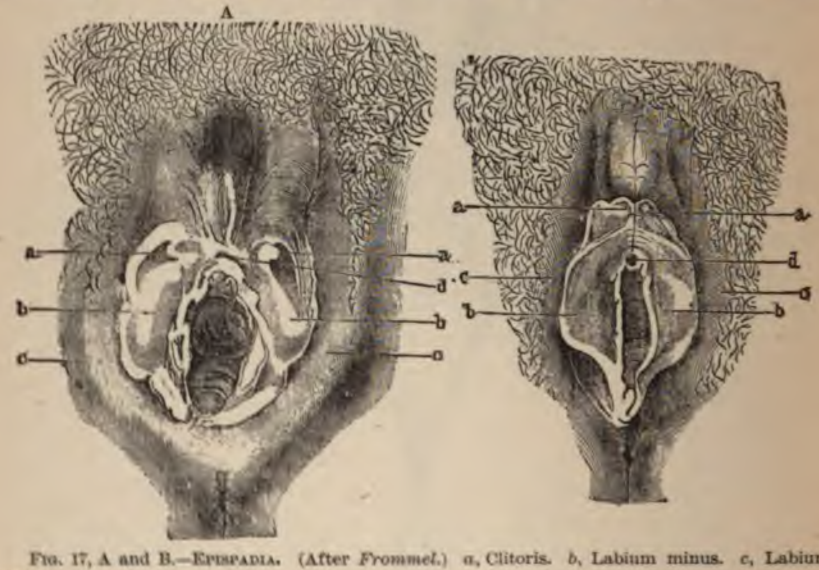

FIG. 17, A and B.—EPISPADIA. (After *Frommel.*) *a*, Clitoris. *b*, Labium minus. *c*, Labium majus. *d*, Urethra.

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[1] Virchow's Archiv., Bd. 29, p. 205.

Etiology.—To understand the origin of these vesical malformations we must glance at the manner in which the bladder itself is developed. The allantois, the original urinary bladder of the embryo, originating as a blind sac proceeding from the intestine, is derived from the intestinal layer. It arises in consequence of the pressure exercised by the urine excreted by the primitive kidneys and collected in the cloaca. In the human subject it is only present for a short time, and is originally double. In the fourth week of pregnancy it has already disappeared; but it may retain its original double form beyond the usual time, in consequence of certain hindrances to its fusion. Rose and Creve think the absence of the symphysis ossium pubis is the hindering cause. Meckel considered the bladder to be originally a simple plate, which only became a cavity from the growing together of its edges. Duncan, and later A. Bonn, and after them B. S. Schultze, Thiersch and others, claimed that the cleft was due to atresia of the urethra with dilatation of the bladder, which first parted the two recti muscles, then separated the cartilaginous pubis, and eventually split the bladder. Klebs[1] thought that there must be some more general cause existent, since it often occurred together with fissures and failures of development of other parts, such as fissura labii, anencephalus, spina bifida, etc. E. Rose, on the other hand, explains every case of vesical fissure as being due to the persistence of the urachus, which has remained patent in consequence of disturbances of urethral development. He calls attention to the fact that in fresh preparations the edges of the bladder are smooth, and show no traces of cicatricial tissue. He only admits rupture as a cause when plain traces of it are present. Mörgelin also was inclined to think that overfilling of the bladder would lead rather to a reopening of the urachus or a rupture into the peritoneal cavity than to a splitting of the anterior abdominal wall. He therefore assumes that the allantois must rupture before the abdominal wall is closed in front. On the other hand we must notice that Hecker (Klinik I. p. 122) extracted a fœtus with atresia ani vesicalis and an enormously dilated but whole bladder, when there was a cicatrised rupture of the abdominal walls; this would doubtless have rendered possible a future rupture of that wall, and of the bladder.

Rose's explanation does not account for those cases in which the umbilical cord is normally constituted and no fistula of the urachus present, the navel ring closed, and the fissure confined to the lower portion of the bladder.

Such cases have been described by Gosselin, Bertet, and others. In these cases stricture of the umbilical cord cannot possibly have caused the rupture. At all events, most recent authorities agree that it is some hindrance to the emission of urine, and as Rose has proven, this may either be due to atresia of the urethra, or to absence of that organ. formerly thought that the prolapse of large and firm organs into the true pelvis might hinder the development of the urethra or even compromise its existence. Thus E. Rose once found the right kidney in the true pelvis; and I demonstrated, in the case that my pupil Dr. Krüger has described, that the left lobe of a much enlarged liver and a whole bunch of small intestine filled the true pelvis, and protruded the diaphragma pelvis outward. Such an obstacle to micturition would of course only cause fissure of the bladder and not a fistula of the urachus, when it occurs after the complete closure of the urachus. Nevertheless, complete eversio of this kind does occur very early, even before the two halves of the allantois are fused. This Friedländer, E. Rose, and I myself have observed. Between, in front of and above the double or single everted bladder, there were folds behind which a sound could be passed. (See Fig. 18.) They arise from the membrana reuniens inferior of Rathke, which closes the abdominal cavity before the skin and the muscle is developed, and forms the covering of fistulæ of the urachus, open bladder, and persistent allantoises. Where the pressure of the urine is strong, the bladders will touch one another, so that no solid body can exist between them; where it is weak the abdominal walls (abdominal plates) are formed as usual around the open bladders, and, when there are two, between them. From the instability of this inferior reuniting membrane

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[1] Handbuch der Patholog. Anatomie, I., 688.

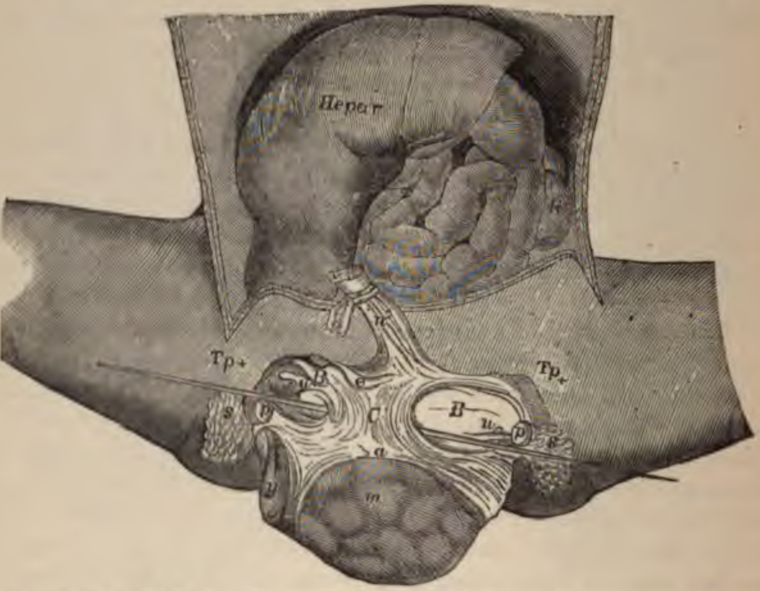

FIG. 18.—*BB*, The two bladders. *C*, Membrana reuniens inferior. *y*, Apertura recti. *u*, Ureter.

the two bladders ultimately touch one another, and the remnants of the membrane form these bridge-like folds (Rose).

In these cases the same cause as a rule that determines the patency of the urachus, or the vesical eversion, will cause the abdominal walls to remain open, the lower portion of the recti muscles to waste, and pelvic deformity to occur. Of course deficiency of the abdominal walls may occur without fissure of the bladder; the whole organ then protruding through the belly walls, forming ectopia vesicæ, which we shall consider later. Ahlfeld's criticism of my case has, however, taught me other views. He objects to the assumption that an enlarged liver, a kidney lying in the pelvis, or a dilated stomach may cause a vesical fissure, since the cleft is always symmetrical and centrally located; which could not possibly occur with a varying cause. At the time at which the vesical fissure must arise, the liver is yet too small to exercise any pressure effects upon the abdominal viscera, and the small intestine consists of only a few coils; the navel ring is then the locus minoris resistentiæ. We often find an enlarged liver lobe in cases of umbilical hernia, but no vesical fissure. Finally, at the time at which the vesical fissure must begin, the urachus, is as thick as the intestine; it would certainly crowd out the delicate allantoic bladder at the tail end of the embryo if subjected to much pressure. For Ahlfeld believes that vigorous traction upon the urachus, when it projects to an abnormal extent beyond the tail end, would crowd out the allantois in front of the rectum, and prevent the union of the symphysis and of the external genitals.

As there is no excretory passage for the allantois, it will fill and burst; the anterior wall will atrophy, and only the posterior become covered with mucous membrane. The intestine will open into the posterior bladder wall by one or more orifices. The rectum usually opens underneath the posterior bladder wall. Ruge and Fleischer deny this, and look upon the tense cord in question as a continuation of the urachus.

I myself believe that an early rupture of the urinary bladder occurs in consequence of urinary retention. To Rose's objection, that cicatrices are absent, I would reply that they are not present because the abdominal walls are not yet closed, and are thus not injured. Besides this I have several times seen children very shortly after birth, in whom the cord was quite normal, and yet a total inversion of the bladder was present. There seems to be no reason why rupture of the bladder from excessive distension during very early embryonal life, should not occur, as it does in extra-uterine life, when there is an impassable obstacle to micturition, as in retroflexio uteri gravida.

That urethral anomalies dispose to fissure of the bladder is demonstrated by the fact that in the male, where the urethra is much longer, and therefore more likely to suffer, vesical fissure is much more common than in the female. Thus Stadtfeldt found, among 14 cases of vesico-umbilical fistula, 12 in boys and only 2 in girls. It is interesting to note that Dr. Wunder of Altenburg, at the Zusammenkunft der osterländischen Aerzte at Altenburg in 1831, presented two boys, aged respectively eight and eleven years, who both had inversio vesicæ urinariæ congenita, and whose mothers were sisters. (Schneider.)

The pelvic deformities to which we have alluded, the fissure and atrophy of the symphysis, the congenital luxation of both femora (as Voss has seen them with eversio vesicæ), all occur as consequences of the same condition which causes the vesical fissure. The dilating bladder drives the horizontal rami of the pubes apart; the altered direction of the pubic bone and its atrophy leads to a lessening of the acetabular circumference, and a less perfect coaptation between it and the head of the humerus. (Voss.)

Symptoms.—Vesical fissure and fistula of the urachus are malformations which do indeed endanger embryonal life, but do not always lead to early death. Many of these children are born alive, and they may even attain a considerable age. Lebert, in the Salpetrière at Paris, saw this deformity in an old woman. The red mucous membrane is usually very sensitive to the touch in the newly-born; and the urine may be seen trickling from the mouths of the ureters in its midst. The mucosa swells out as the intestines move about. If the opening is small, the mucous membrane may become inverted, either through the urachus, inversio vesicæ per urachum, or through the vesical opening, i. v. per fissurum. If the orifice is very small, however, the trouble may subsist for years without inversion occurring, as it did in Mörgelin's case. If we replace the prolapsed mucosa, and thus indirectly press upon the dilated ureters, the urine spurts out. Occasionally these persons can retain their urine to a certain extent. That occurs when there is umbilical hernia with the urachal fistula, and the posterior vesical mucous membrane is pushed by intestinal coils into the orifice of the fistula, and closes it for a time. Paget has described such a case, in which the hernial sac of the goose's egg-sized rupture was formed by the mucous membrane forming the posterior wall of the fistula; so no urine could escape when the hernia was prolapsed. If the patient desired to micturate, the hernial tumor receded as the first contractions of the bladder took place, and as it disappeared a fairly strong stream of urine came out of the opening. Then urine began to flow through the urethra, only coming through the umbilical opening again if the pressure was much increased.

And even with complete eversio vesicæ an occasional retainment of urine may be effected by the muscular tissue of the thickened bladder wall, it acting as a quasi sphincter. Thus Voss has recorded a case of a girl 2C months old whose urine did not easily flow off when lying quiet; her bladder wall was ½ of an inch thick in its middle, and the mouths of the ureters ¼th inch long.

In more deeply situated vesical fissures the simultaneous occurrence of inguinal hernia, as Bertet saw, may form a kind of cover for the fissure, and enable the patient to retain her urine. No such case is known to me.

As a rule the constant flow of urine keeps the lower margin of the fissure red, eroded, ulcerated, painful, burning, and itching, and patient spreads a most unpleasant smell. It is remarkable that after a short time the epidermis spreads from the edges of the skin into the true mucous membrane. Sometimes we can see by observation of the mouths of the ureters how completely independent of one another the two kidneys act; one secreting while the other is quiescent, or both acting at the same time. Occasionally the mucous membrane undergoes a change; fungous outgrowths appear, having a great tendency to bleed, and liable to be mistaken for malignant neoplasmata. Patients suffering from eversion of the bladder always have a peculiar, uncertain and unsteady gait, easily explained by the diastasis of the pelvic bones which accompanies it. Palette even noticed a marked limp. Of course the separation of the pubic bones alters the relations of the pelvic diameters to one another; the transverse will be considerably greater than the antero-posterior diameter; and this preponderance becomes greater as age advances, so that it may eventually become as 2 or 3 to 1 (Mörgelin.) Females with vesical fissure may not only become pregnant, but may be delivered without special difficulty, as the experiences of Huxham, Olliver, Bonnet,[1] Ayres, Litzmann, Günzburg (2 cases) and Gusserow teach us. In Ayres's case, which was cured by operation, a prolapsus uteri occurred post partum.

Diagnosis.—Long ago Tenon, Buxdorff and Castara recognized the tumor which they saw as the bladder; but they did not know that they were looking at its inner surface. Devilleneuve first had his attention called to it by the presence of the orifices of the ureters, and by the mucous membrane-like surface of the tumor. Bonn noticed that when he introduced his finger into the rectum, he could feel no bladder, but directly reached the inter-pubic space. The visible dribbling of urine from the surface, and the recognition of the mouths of the ureters and the diastasis of the pubic bones, ought to facilitate the diagnosis. Nor is the malady so extremely rare. In 12,689 new-born children with 27 malformations, Sickel found it twice; I had one case among the 3,500 children that were born at the Dresden Institute from 1872-75. In 1833 Velpeau could mention over 100 recorded cases, and Percy claimed that he had met with over 20 persons so affected in his practice. I have altogether seen it 5 times; 3 times in girls, 2 times in boys. Philipp has collected 21 cases of inversion of the bladder in girls. In Wood's 20 cases only 2 were in women.

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[1] Philosophical Transactions, Vol. XXIII., pp. 142, 408.

Prognosis is decidedly unfavorable. Most children thus affected are sickly from birth, and die early. During life they suffer much from ulceration; and this, with the inevitable odor. renders the life of such as survive but a pitiful one. In addition to this only complicated and very burdensome apparatuses can be used to retain the urine; and operative treatment is difficult, very tedious, and only partially possible. But for cases in which the eversion is not complete, cases of urachus fistula or simple fissure above or below the symphysis the prognosis is much better, and treatment not unfrequently entirely successful.

Therapy.—Stadfeldt has proved that out of 8 cases of fistula of the urachus treated by operative procedure, 7 are cured. He recommends in depressed fistulæ to freshen up the edges of the mucous membrane and the skin, and unite them with sutures. When the edges are fungoid a ligature or clamp must be applied. But it seems preferable to me to remove the abnormal growths, and proceed at once as first recommended. Occasionally after renewing the margins the introduction of 1 to 3 hare-lip pins will cure the fistula in 2 to 4 weeks. (Paget.) M. Jacobi treated one case by pressure and another with the actual cautery, and was successful in both.

If there is a fissura vesicæ superior or inferior, we must first ascertain whether the tension upon the edges of the cleft will be relieved by longitudinal incisions through the skin some 1 to 2 inches distant. The edges may then be freshened and closed with a row of sutures. Unfortunately it is only in exceptional cases that we can obtain a complete cure by means of this operation.

In cases of actual inversion of the bladder, an operation was formerly unthought of, and our efforts were restricted to the application of apparati to cover the vesical mucous membrane, and catch the urine. Such arrangements have been described by Fried, Stolte, Bonn, Lobstein, Rose, Stark, Jurin, Boyer, Breschet, Dubois, and others. A metallic capsule with a reservoir for urine attached to it is used, and the whole arrangement can only be of use when the patient is standing up. Wolfermann has constructed an apparatus after Deunne, which, when the patient is recumbent, exercises an antero-posterior pressure upon the bladder, closing the vesical fissure and dilating the bladder, and making side-pressure also upon the pubic rami, to draw them together. (See Fig 19.) Mörgelin's cases were three boys, and the penis was used to close the vesical fissure. Wolfermann's apparatus consists of (A) a metallic cup, pointed posteriorly, and fitting the perineum exactly, and reaching to just in front of the anus; (B) a metal plate extending from the upper edge of the vesical fissure down to the cup A, and united to it by a charnier, and like it, covered with a solution of rubber; (C) spring-band, with pad, D, to approximate the pubic bones; (F) a belly-band to fix B; and (E) a reservoir attached to A, and hanging down between the legs. This arrangement is said in three of Deunne's cases to have answered all the requirements "as well as could be expected in a palliative apparatus for fissure of the bladder." In two cases the dilation of the bladder and the approximation of the pubes succeeded so well that there was no further obstacle to operative interference. Berend's apparatus is similar to this.

Gerdy in 1844 was probably the first to rectify by operation an everted bladder. Since he could not replace it, he attempted by a partial excision of the ureters to form a sufficiently large sac posteriorly; but the patient succumbed to peritonitis and nephritis. The proposition of Jules Roux, in 1853, to form an artificial cloaca by separating the ureters from the bladder, and implanting them in the rectum, was indeed once successfully done by J. Simon; but the patient died twelve months later of peritonitis and exhaustion. His attempt to close the vesical fissure by means of skin flaps was unsuccessful, they becoming gangrenous on the fourth day. Ten years later, however, the attempt was more successfully made by John Wood and Holmes; and their results have been already criticised by Podrazki, (Vol. III. Part II. of this book). The first surgeon who claims to have cured a female patient by this method was Ayres of New York. He took a long flap from the lower median part of the abdominal walls, turned the epidermic surface towards the cleft, and then united it to the skin at the

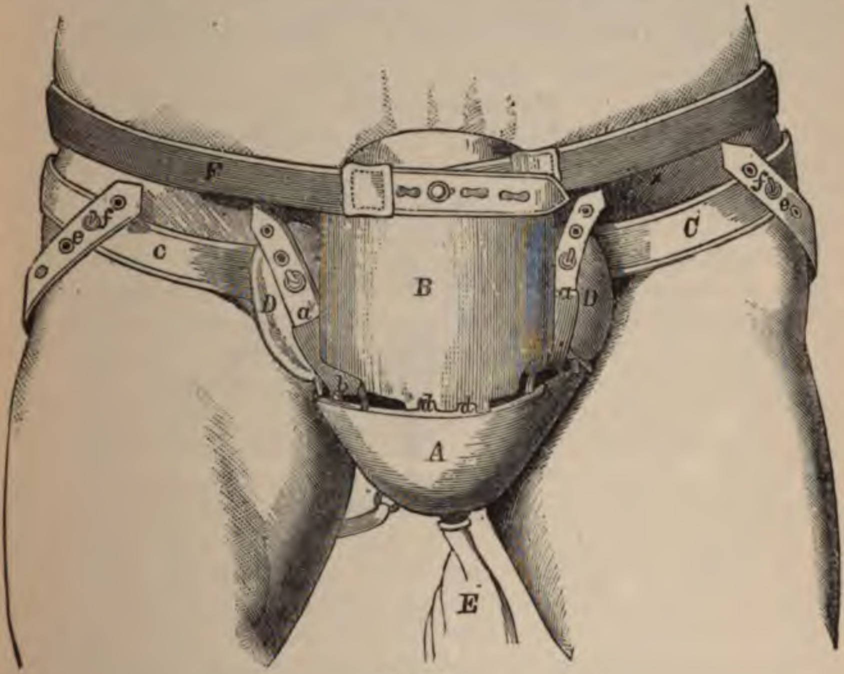

FIG. 19.

edges of the vesical fissure. After Ayres, Wood operated once upon a girl eighteen months old, in whom the urogenital sinus was exposed by the vesical fissure, so that the cervix and os uteri were always wet with urine. W. took a flap from the skin above and on one side, turned their epidermic surfaces to the bladder, and then covered both by a large flap from the other side; but the vesical mucous membrane pushed its way out below, bursting the delicate adhesions.

Ashhurst's case had greater success. He took from the skin below the navel a flap large enough to completely cover the defect (Fig. 20, A), turned it down, and covered its outer surface with the two side flaps B and C, so that their upper borders *a b* and *a′ b′* met in the median line. The

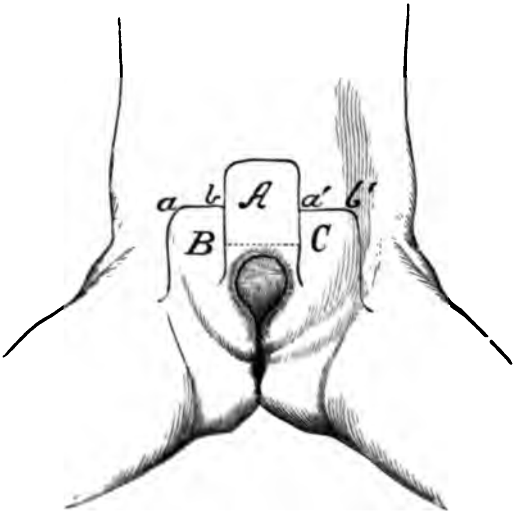

FIG. 20.

flaps were united by sutures, and on both sides of the upper one were passed soft iron wire sutures, which were then carried through the bases of the transplanted side flaps, and wound round small rolls of sticking plaster. Tension did not occur; the flaps healed by first intention; the last suture was removed on the eighth day, and the rest of the wound healed by granulation. Incontinence of urine persisted, however, in the upright position, so that the patient had to wear a urinal; when lying down, however, she could hold her water for two hours, and her general condition was greatly improved.

Ashhurst reviews all the 20 cases of eversion of the bladder that had been so far treated by operation, 14 of which by Ayres, Holmes, Wood, Maury and Barker were successful, 3 by Holmes and Wood failures, and 3 by Richard, Pancoast and Wood with fatal terminations. In 2 of the last cases the fatal result is said to have been unconnected with the operation.

But all these operations with inverted flaps are liable to the disadvantage that the hairy growth will lead to continual deposits of salts. For this reason, and because injury to the peritoneum is very possible between the recti muscles, and the flaps when of large size readily mortify, Thiersch has abandoned this method. He proposed to cover the orifice with simple side flaps. Each flap is to be large enough to cover the entire opening in the fresh state. The inner margin of the lower flap follows the inner margin of the rectus muscle closely above, and is accurately attached to the margin of the bladder. The outer border is parallel to it, and goes down to or beyond Poupart's ligament. This entire band of tissue is attached above and below, but is entirely free underneath.

To secure the necessary amount of blood, the sheath of the rectus, the tendons of the external oblique and the fascia lata, must be denuded. The flaps may then be allowed to granulate *in situ*, or a plate of ivory or glass may be placed under the flaps, to keep the granulations short and healthy. After three weeks the upper connection of the flap is to be cut diagonally from below and within to above and outwards; the whole is then turned over the lower part of the bladder, the opposite edge of that organ is freshened to the symphysis, and stitched to the edge of the flap. The somewhat shrunken flap now covers the lower two-thirds of the bladder. In all his six cases Thiersch only then fixed his flaps over the bladder, and brought the surface of the wound into permanent contact with the urine, where stationary granulation had set in in the flap. When the union of this lower flap is complete, he proceeds to close the upper part of the bladder. The second flap is taken from the other side, stretches from the inner incision to the point of origin of the lower flap; and the external incision is not carried so deeply as in the first case. At the same time the skin to the width of ½ to 1 inch is to be carefully loosened from the recti muscles at the upper margin of the bladder, to get a granulating surface, which, like the granulations of the flap, must be kept from becoming exuberant. In 3 to 4 weeks the upper end of the flap is to be divided as described, and the flap turned square over the bladder. Its lower margin is then in contact with the upper margin of the first flap; its freshened end is sewn to a freshened place in the skin lying opposite to it, its granulating surface covers the upper portion of the vesical mucous membrane, but also projects beyond it over the granulating surface which was formed at the upper margin of the bladder. Then, after freely freshening them again, the contiguous edges of both flaps are united by deep and superficial sutures. Henceforward the urine can only flow below, and a short silver catheter should be introduced.

In the male subject the plastic treatment of glans and scrotum takes twelve weeks more, so that Thiersch takes a whole year to completely close the male bladder. Then by using a compressorium to the glans the patient can retain urine to the amount of six ounces. Thiersch lays special stress upon the importance of making the flaps as long and broad as possible, since he found that the capacity of the bladder increased the less resistance there was from the anterior wall. The compressorium must therefore have a hollow, concave capsule attached to it, to permit the anterior bladder wall to dilate.

In girls Thiersch's operation may be done more simply and in shorter time. Although even when the closure of the bladder is almost complete, continence cannot well be attained, since it is impossible to supply a sphincter, yet slight pressure with an instrument will in time cause a certain dilatation of the bladder under urinary pressure. That alone is of great benefit to the patient. She can keep herself dry, does not always smell of urine, does not get sore, does not suffer continual pain from the irritation of the mucous membrane—advantages which would certainly decide most of these patients to submit to an operation which does not in itself involve any danger.

Vogt's attempt[1] to construct an entire bladder of mucous membrane, by loosening it at its attachment to the anterior abdominal wall, uniting its edges, and then covering it with a flap of skin, was not successful.

Billroth's method is simpler than that of Thiersch. He loosens two broad flaps, leaving them attached above and below, and in 10 to 14 days, when the under surface is granulating freely, unites them in the middle line. If the flaps are broad enough, no lateral stitches are needed; the side openings closing of themselves in 5 to 6 weeks. The bladder is thus completely covered, but a small fistula is left at the navel, through which the urine is passed until the urethra is completely closed below. The fistula then heals spontaneously, or is closed by freshening and sutures.

In two of the rare cases of epispadia, which have been above described, the patients were cured by K. Schröder operatively, so that they could retain their urine four hours. In the case figured by Frommel, the whole surface freshened was of the shape of an equilateral triangle, the apex being at the mons veneris, and the sides running down to the lateral halves of the clitoris. From these latter points the line of denudation ran to the lateral borders of the urethral opening. The skin was dissected from the triangle; and to make a urethra a small needle was passed from below the urethral opening into the wound, and then carried out on the other side of the urethra from the freshened surface to near the edge of the wound. Four such stitches formed a urethra $\frac{1}{2}$ to $\frac{4}{5}$ inch long in addition to what was already there. While the sutures were being applied a metallic catheter lay in the urethra. Then the two sides of the

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Mittheilungen aus der Chirürgischen Klinik in Griefswald, 1884.

triangle were united by superficial and deep sutures. The wound healed per primam. From the beginning the patient could pass her urine spontaneously; catheterism was not necessary, and she got well.

DEFICIENT VESICAL DEVELOPMENT, DOUBLE BLADDER, VESICA DUPLEX, PARTITIONED BLADDER, VESICA BILOCULARIS.

"Cases of double bladder will become rarer as the knowledge of pathological anatomy advances," said Vidal, remarking that pathological septa have probably been taken for a double organ. He then mentions Molinetta, who in his *Dissertationes Anatomico-pathologicæ* speaks of a woman with five bladders, five kidneys, and six ureters; and Blasius, who has described a case of complete division of the bladder into two halves, with a single urethra issuing from the joint neck, and a separate ureter for each. Besides this example, which Gerardus Blasius found at the autopsy of an adult man, double bladders have only been found in young children. Thus in Isaac Cattier's child, which lived to be fifteen days old, the two bladders were divided from one another by the rectum. Sömmering found the abnormality in the body of a child two months old; and Schatz found it recently in a marasmic female infant that lived twelve hours, together with complete division of the entire genital apparatus, and congenital double vesico-vaginal fistula. (See Fig. 12.) We noticed other double bladders when we considered vesical fissure (See Fig. 18). In these cases some obstacle has prevented the coalescence of the double rudiments of the allantois; and each portion has become a separate cavity, and has retained one ureter. This, of course, must occur during the first four weeks of embryonal existence, and Blasius's case shows that it does not always endanger life. The malformations which generally accompany it are of greater importance. It will probably never be the object of medicinal treatment. A diagnosis during life may be made by finding with the catheter two spaces in the bladder divided from one another, and feeling the partition through the abdominal walls.

A less marked degree of defective development is that in which the organ is externally apparently single, or is simply furrowed, there being a septum inside; vesica bilocularis. Thus Karpinsky found a partition running from the fundus to the urethra, but incomplete below; Ash demonstrated in one case the existence of a firm membranous wall, the opening between the two being so small that the two cavities could hardly be considered united; and Testa saw a complete septum. Scanzoni accidentally found the bladder divided into parts in a woman dead of tuberculosis; but he does not say whether it was complete, or whether the exterior of the organ showed signs of division.

In all these cases the partition was vertical. But horizontal septa have been found, arising from the ligature of some part of the bladder by a band, possibly the involuting urachus.

The case of cyst of the urachus in the female, which Roser (Marburg) has recently described, belongs here. The canal was enormously dilated, was closed at the umbilicus, and communicated by a small opening with the bladder. Contractions of the latter viscus would cause urine to be spurted into the cyst, and so fill it, till finally the exertion of abdominal pressure emptied both it and the bladder per urethram.

Of course many examples of diverticulæ of the bladder, of which we will speak later, have been mistaken for developmental faults. This E. Rose proved in the case that Tenon examined, where the bladder was divided by a septum perforated in its middle. A more exact examination showed that both great divisions consisted merely of projections of mucous membrane between the meshes of the muscularis. In the case of Volcherus Coiter, who described a girl with two bladders, there was really only one bladder and a cyst, and Rose believes that in Molinetta's case with 5 kidneys, 6 ureters, and 5 bladders, there were possibly only multiple sacculated dilatations of the urethra.

From all this it is plain that even upon the *post-mortem* table it is easy to be mistaken in the diagnosis of defective vesical development, and we must carefully examine the shape of the organ, look for external constrictions and internal septa, and scrutinize the substance of the lateral walls of the bladder. The very slightest degree of the malformation is that described by Chonsky, in which there was a simple marked longitudinal constriction of the organ.

Diagnosis.—A vertical septum of the bladder may be diagnosed by the catheter, and by the finger after urethral dilatation. A horizontal septum can only be found after enlarging the canal of entrance. If there be a tumor above the empty bladder, concerning the nature of which we cannot make ourselves certain by external examination, again the urethra must be dilated, and the point of communication examined with the finger, and finally a long elastic catheter passed into the upper tumor.

Treatment.—The removal of vesical septa is of course not to be thought of; if the bladder became diseased, it might be necessary to determine whether one or both halves were affected. This is to be done with the catheter and the specula, and finally with Rutenberg's illuminating apparatus, and a suitable treatment begun. If there is, as in Roser's case, a urachus cyst above the bladder, and if its constant dilatation by the contractions of the bladder give rise to trouble, the extirpation of the cyst from the external abdominal walls, with freshening and suture of the walls of the orifice communicating with the bladder, would be the only measure that would radically cure the patient.

CHAPTER XII.

MALPOSITIONS AND MALFORMATIONS OF THE FEMALE BLADDER.

I. *Displacement of the Bladder, especially with Vesico-vaginal Fistula; Cystocele Vaginalis.*

THE uninjured bladder may be displaced as a whole in any direction, upwards, downwards, anteriorly, posteriorly, or laterally; and finally it may be sub-involuted.

Displacement upwards only occurs as a rule from traction from above, or pressure from below. Traction may be applied to the vesical wall through its peritoneal covering, which exerts a certain tension when the internal genitals are displaced upwards, or when there is adhesion of the vesical surface to the ovary, the uterus, or the intestine (page 26). Thus again, the pregnant uterus as it enlarges, a growing ovarian tumor, or a coil of intestine, may exert traction. But even without the pelvic organs rising out of the true pelvis they may influence the shape and position of the bladder; thus retro-flexion of the uterus may cause a dragging of the lower bladder wall backwards or upwards (see Fig. 25). Tumors located below the vesical neck, as small ovarian cysts, rectal tumors, and those growing from the pelvic walls, and others, may elevate the bladder. The bladder has been found in large herniæ, and even partly in the foramen ovale.

All these changes of position are only of importance inasmuch as they dislocate the urethra, compromise its lumen, and cause dysuria and ischuria, and render the introduction of the catheter more difficult than usual. Remove the cause, and the vesical dislocation usually easily and quickly disappears. If the bladder is attached by adhesions to surrounding parts, careless catheterization, too rapid emptying of the organ, a too flat position on the part of the patient, and a failure to close the catheter at the proper time, may cause air to enter the bladder through the instrument, as we have already noticed in page 22, when discussing the different methods of examining the organ. Air, however, is not so hurtful as was formerly supposed, since repeated examinations by Rutenberg's method have been made without evil result. And in most cases it is undoubtedly

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[1] S. Förster: Handbuch d. Pathol. Anat. II. 534.

not the air, but the use of unclean instruments, that causes the malady of the mucous membrane.

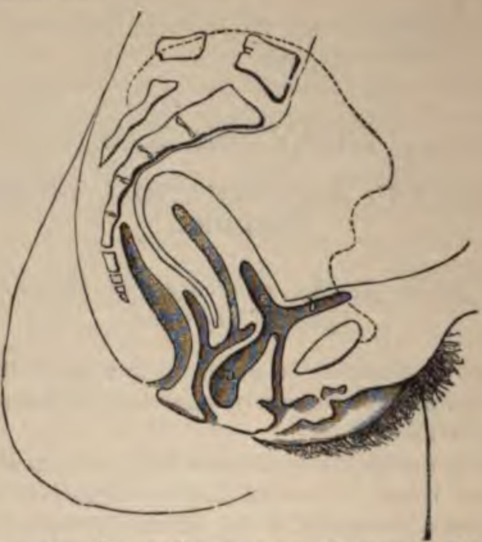

FIG. 21.—PROLAPSE OF THE VAGINA. CYSTOCELE WITH RETROVERSIO UTERI. *a, b, c,* Bladder. (After *B. S. Schultze.*)

The longer adhesions between the bladder and surrounding parts exist, the less harm do they do, since the continual traction caused by the alternate filling and emptying of the viscus continually tends to make them less resistent, longer, more extensile, and less hindersome.

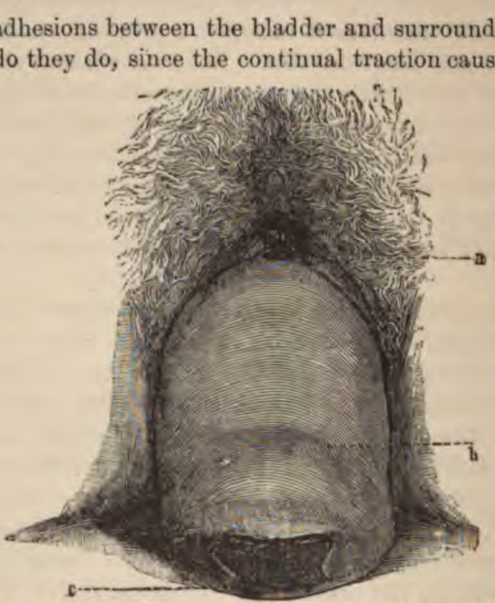

FIG. 22.—INCOMPLETE PROLAPSUS UTERI, WITH CYSTOCLE VAGINALIS. *a,* Orificium urethræ. *b,* Lower border of cystocele, *c,* Orificium uteri externum.

By far the most important anomalies of position is that which is known as vesico-vaginal-prolapse, cystocele vaginalis.

The causes as a rule are to be found in an antecedent pregnancy and child-birth. In this condition the vesico-vaginal septum becomes hyperæmic, loosened, lengthened, and is exposed to pressure from above, which pushes down the bladder wall and the tuberculam vaginæ, especially at the time of delivery. Thus the upper part of the urethra is carried downwards (Fig. 23); all the structures of the pelvic floor are so stretched, and the introitus vaginæ so dilated, that the other organs descend for want of an efficient support. This of course occurs to its greatest extent when the rima vulvis is enlarged by a rupture. Given such predisposing conditions, the direct causes of vesico-vaginal hernia are usually increased abdominal pressure during the lifting and carrying of heavy objects or by efforts at defecation, which latter are especially prone to do damage when the bladder is partly or entirely full. It is easy to convince oneself, by requesting the patient to press down, that when the tuberculam vaginæ descends, the genital orifice begins to gape, and the tumor that dilates it grows rapidly. As a rule the primary displacement is that of the vesico-vaginal wall, followed by descensus and prolapsus uteri incompletus. But in many cases the reverse occurs. Hypertrophy of the neck of the uterus, or tumors situated upon it or in its walls, drag

Fig. 23.

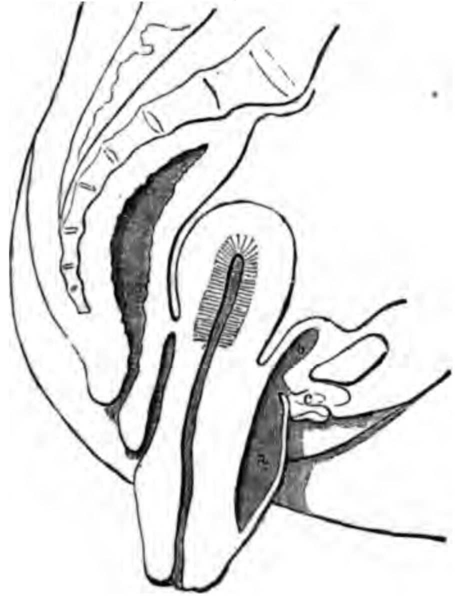

FIG. 23.—PROLAPSUS UTERI INCOMPLETUS. Inversio par vaginæ anteriosis. Cystocele: *a* and *b*, Parts of the bladder. *c*, Urethra. *d*, Uterus. (After *B. S. Schultze.*)

or press the uterus downwards, and the bladder follows after. Age is especially predisposing; cystocele is most common in the years from thirty to forty. Occupations which involve much standing, lifting, or carrying heavy weights will render even nulliparous women liable to it.

In comparison with those just mentioned, the other causes of vaginal cystocele occur but very rarely. It may happen with prolapsus uteri in women who have never borne children, in consequence of a fall, or of excessive exertion, as Malgaigne has observed; or tumors of the vesicovaginal septum itself may drag it down. It may occur as a vesical diverticulum, where the corresponding portion of the viscus is weighted with a large calculus, which Ruysch has noticed.[1] But in most such cases the process is reversed; there is first the cystocele, and only later the formation of a calculus. This was so in Gendrow's case, where a woman sixty-five years old, and who had had seven children, had a cystocele out of which two stones were spontaneously evacuated. In this category belong also the cases of Eyster and Galabin.

Anatomical Relations.—In slight degrees of this affection the lower part of the bladder is somewhat sunken; in more marked cases the viscus is hourglass-shaped (Figs. 21 and 23), being divided into an upper and a lower part by the horizontally placed urethra, in which we often find small hypertrophies of the mucous membrane. In the highest grades (comp. Fig. 24, after Schröder), where there is also complete uterine prolapse, the bladder may be so twisted that the orifice of the urethra will be above, and the canal itself extend downwards to the bladder, which is upside down.

When the malady has existed for a long time we find also changes in the bladder walls; they become thicker and more succulent, not from stasis and œdema, but from hypertrophy. (Comp. Fig. 24.) The mucous membrane is sometimes in a condition of chronic hyperæmia and catarrh. The dragging upon the fundus vesicæ may further cause dilatation of the ureters and hydronephrosis; Philips, Froriep, Virchow, Braün, etc., have seen this happen. It is of importance to note that the malposition causes the excavatio vesico-uterina to become deeper, and the peritoneum to descend to the vagina. If the prolapse is considerable, coils of the small intestine may descend into it. However, the vesico-uterine excavation is usually closed, and is found as a third cavity when cut into. (See v. Franqué.)

The symptoms of cystocele vaginalis are partly those of prolapse of vagina and uterus: we will naturally confine ourselves to those caused by the bladder and seen in that organ itself. Not infrequently there is at first only drawing sensations in the navel region, probable from tension of the superior vesical ligament; and also anomalies in the urinary secretion, such as dysuria, frequent desire to micturate; they may even be unable to empty the bladder unless they replace the tumor beforehand. I have found, however, that these difficulties do not occur nearly so often as might be expected; that many women with considerable vesical dilatation do not have the least trouble with their urine. And I must confess that in 68 cases of cystocele I have never seen vesical catarrh, which Golding Bird says is specially liable to occur in women who are in the climacteric years. I admit that it will occur the more easily the greater the portion of the bladder is which protrudes from the vulva, the longer retention remains, and the more frequently the catheter is used.

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[1] Compare Chap. VI.: Vesical Calculi.

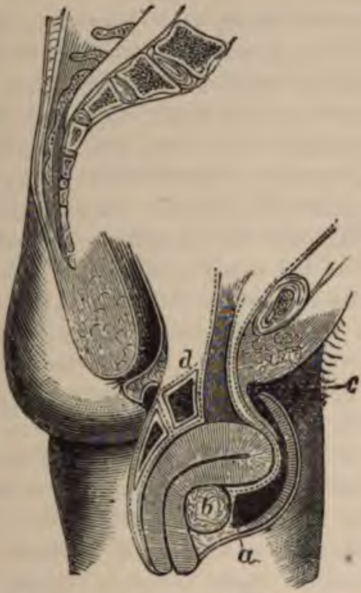

FIG. 24.--COMPLETE PROLAPSE OF THE ANTIFLEXED UTERUS, WITH A MYOMA IN ITS ANGLE (*b*) The apex of the bladder is displaced down to *a*. The urethra is up at *c*. The intestine has descended. (After *K. Schroder*.)

Ramsbotham found that cystocele might be an obstacle to delivery, especially when there is slight contraction of the pelvic outlet. McKee was once called to such a case, in which he could not succeed in catheterizing the prolapsed and over-distended bladder. He therefore punctured it with a lancet; delivery was rapid, and the woman got well. Ramsbotham says that Merriman tells of a case in which a physician mistook the prolapsed bladder *in partu* for a hydrocephalus, and punctured it. More recently Brennecke, Dick, More, and Spencer have published accounts of cases of this class. Brennecke believed that the occipito-anterior position of his case was caused by the cystocele, and found that after emptying the bladder with the catheter the violent pains ceased. The furious bearing-down pains, not coincident with actual delivery, and disappearing after the bladder was evacuated, were characteristic.

But even granted that most vaginal cystoceles do not cause nearly all the symptoms that are generally ascribed to them, it must be admitted that so soon as a catarrhal condition of its inner surface and ammoniacal decomposition of the urine occurs, their results may be much more unpleasant than when they do not occur in a prolapsed bladder; for the inflamed bladder is subjected to abnormal pressure and tension, and its evacuation cannot be so perfect as when in the normal condition. If there occur stasis of urine, dilatation of the ureters, and hydronephrosis, uræmic symptoms will not be long wanting. From the tension upon the peritoneum there will occasionally occur subacute inflammatory processes in the neighborhood of the bladder; pericystitis, and long-standing prolapsus when neglected may eventually cause so many adhesions to neighboring organs that reposition may finally become impossible.

Diagnosis.—Most patients when they notice a tumor appear at their external genitals soon consult a physician for the greatly feared "falling of the womb." Recognition of their trouble is usually easy. In 74 cases of prolapsus vaginæ Malgaigne found cystocele vaginalis 39 times. The patient is placed in the lithotomy position, is told to press down, and when the tumor attains its greatest size it is to be grasped with the left hand, and fluctuation will be detected. Then a vaginal examination is made to find how far the cervix has fallen. A metallic male catheter is now introduced into the tumor, with its concavity directed downwards; if you succeed, the instrument can easily be felt in the tumor, and the diagnosis is certain. Finally the urine drawn off must be examined for pus, albumen, and casts. After drawing the urine the tumor seems smaller and its vaginal walls are wrinkled. After carefully considering the causes of the malposition, an attempt at replacement is to be made, to ascertain the mobility of the organ.

If, with Jobert, we very carefully diagnosticate cystocele during life, and fail to find it *post mortem*, it does not prove that our diagnosis was at fault. Prolonged rest in the horizontal position tends to cause the tumor to disappear, and if it has not been of long standing there may be no demonstrable anatomical changes after death.

The prognosis is in most cases good, since the malady causes but little trouble, and may be held in check by palliative measures. If neglected it tends continuously to increase and become more and more annoying. In old individuals especially, from the relaxation and thinness of their organs, it is difficult to devise suitable methods of retention. A radical cure of cystocele can, however, only be obtained in most cases by operation. Though Scanzoni, in 1859, declared that he had never seen a permanent result from the operative treatment of cystocele vaginalis, nowadays the reverse may be maintained, and unsuccessful operations are among the rare exceptions.

Therapy.—Reposition and retention are the only indications for treatment. The first one is usually simple to fulfill; but the second often exceedingly difficult. Reposition may be effected with the hand when the patient is in the dorsal position; it is hardly ever necessary to use the catheter for anything else than to completely empty the viscus. That accomplished, retention may be effected palliatively by pessaries and tampons, or radically by means of various operations. In the beginning and with the slighter grades of the affection, tampons with astringent salves may do good.

But in later stages this mode of treatment will not accomplish much, though when a patient will not consent to an operation, and has acquired catarrh from a pessary, we may be compelled to have recourse to it.

Since most patients will not submit at once to a bloody operation, we must as a general thing use at first at least the mechanical means of retention. Of the long list of these apparatuses we will mention those only that are especially applicable to cystocele. Among these we reckon stem, external, simple and winged pessaries. C. Mayer's simple round rings of rubber do good service in the slighter cases. But they are too yielding, and are at once squeezed out in more pronounced cases, and we may then use hard rings of round rubber well shellaced. These round pessaries are pushed over the levator ani and pelvic fascia, and by dilating the vaginal vault tend to keep the prolapsed vaginal wall in place. But even the largest of them will be expressed when the vulva is dilated and the pressure considerable, and then the Martin stem-pessary may be used. Besides these a few cases may require the Zwanck-Schilling hysterophore. For I have found cases in which all other instruments could not be retained, but this one could. Its thin edges, however, may do harm by pressure, and may cause a vesico-vaginal fistula.

Some patients may be improved by the use of stem pessaries fastened to an external belly-band, such as those of Roser and Scanzoni. I formerly permitted patients to carry these for long periods of time, but do so no longer. Poor patients cannot well afford to get them, and all soon begin to complain of pain and burning, since the arm may easily cause ulceration in the urethral region. And if the pressure is great, the knob at once glides out, the arm falls, or the vaginal wall slides down beside or behind it.

The Scotch hysterophores which Breslau[1] has especially recommended are better, but can only be used for the less severe cases. They dilate the vagina both antero-posteriorly and transversely; but they often cause irritation and may readily set up catarrhal trouble in unclean individuals.

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[1] Scanzoni, Beiträge, IV., 275.

For some patients a lightly-applied T-bandage is sufficient, and this, with the tamponade should at all events be tried in the less severe cases.

For a radical cure of inversion and cystocele an operation is needed; an operation so simple and effective that, if the measures already described do not quickly succeed, it should be proposed to the patient.

The operation consists of the excision of an oval piece of the anterior vaginal wall, and is known as colporrhaphia anterior. The origin of the operation and its slow perfecting may be read in Marion Sims's clinic, p. 228. Sims claims that until his time nothing had been done in an operative way for cystocele, and that its success is due to the use of the silver suture; a view which is not correct. The length and breadth of the excised piece depends upon the grade of the inversion and the cystocele. The more extensive this is, the longer and broader must the piece be, extending in the worst cases from the tuberculam vaginæ to the anterior lip of the uterus, and measuring 2½ to 3 inches across.

The woman is prepared by injections and by emptying the bladder, is placed in the dorsal position, and is anæsthetised. The anterior lip of the uterus is then strongly drawn downwards with a hook or a thread, so that it approaches the posterior commissure. The assistants hold the legs, draw the nymphæ apart with sharp hooks, so as to expose the entire field of operation. The anterior vaginal wall is then thoroughly washed with a 3 to 5 per cent. carbolic acid solution, and an irrigator trickles some of the same fluid over the wound during the entire operation.

The incision is begun below. The outlines of the piece to be excised, are lightly marked with the scalpel, then the deep incision is made, beginning at the left and going through the entire thickness of the vaginal wall. As soon as the loose connective tissue between vagina and bladder is reached, the handle of the scalpel only must be used to separate them. In the middle of the piece to be excised, are one or two larger vaginal arteries, arising from the uterine, as well as some veins. The arteries must be seized with the catch-forceps. The excision of the entire oval piece takes 5 to 6 minutes. The surface of the wound is then smooth; any islets of vaginal tissue that have been left are removed, the surface then freely washed again with the carbolic solution, and then the stitches applied. The points of entrance and exit should be ⅜ inch from the edges of the wound. If the surface freshened is very large, the sutures, if passed behind the entire surface, would cause it to lay in folds; they should therefore be brought out at the middle of the wound, and the needle reintroduced half an inch further on and brought out at the opposite side. In smaller excisions all the threads may go behind the entire denuded surface.

Ligature of the divided arteries is unnecessary. The sutures pass behind them, and they are enclosed in the threads when they are tied. To overcome the greatest tension gradually, the sutures must be tied alternately above and below towards the middle. I hardly ever apply superficial sutures, while K. Schröder, on the contrary, uses a few deep sutures and many superficial ones; a procedure which Werth has rightfully characterized as improper. As soon as all the sutures are closed, the neighborhood of the wound is carefully washed, and the whole wiped dry. When not a drop of blood longer exudes, the vagina can be replaced. It is not necessary to use protective or a cotton tampon.

As a rule it is unnecessary to use the so-called sunken sutures which Dr. Werth (Kiel),[1] has proposed; and they may hinder union. I prefer *fil de Florence* for the sutures. The whole time of operation is 20 to 25 minutes.

If the patient after the operation can pass her water voluntarily, as is most commonly the case, there is no need of catheterization. Ischuria, however, does occur, since the stitches are carried through the bladder wall. If vesical pain or catarrh follows the use of the catheter, the bladder must be washed out with a 1 to 1000 solution of salycilic acid, or a 3 per cent. solution of boracic acid.

The stitches must remain in at least eight days; if *fil de Florence* is used they may remain in for weeks. Silk sutures must be removed in six to seven days.

Defecation must be seen to after the fourth day, and on the twelfth to fourteenth the patient can get up. By this time the cicatrix is stout enough to withstand considerable pressure. If the patient belongs to the poorer classes she must for a time avoid heavy work.

In very marked cases of inversion with cystocele, which usually occur in combination with descensus and prolapsus uteri, colporrhaphia anterior alone is insufficient, and must be combined with the similar posterior operation.

It may be necessary to remark that on account of their uncertainty and the liability to cause trouble in neighboring organs, we have entirely abandoned the use of strong caustics, as fuming sulphuric acid, chloride of zinc, or the actual cautery, for the purpose of diminishing the amount of tissue present.

Supplement.—In Fig. 25 I have reproduced a drawing from Schatz, which may be described as showing *retroflexio vesicæ urinariæ.* The posterior vesical displacement is caused by the fall of the womb. I have lately seen the same thing at the *post-mortem* examination of a non-pregnant woman. The uterus lay horizontally in the true pelvis, and its fundus was adherent to the rectum. The portion of the bladder that was drawn backwards formed a diverticulum which contained a calculus, and the vesical neck was securely fastened to the rectum by adhesions which ran over the uterus.

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[1] Centralblott f. Gynäcol. 1879, No. 23, p. 561.

II. *Ectopia of the Unfissured Bladder, and Prolapse of the Bladder through the Urethra.*

Ectopia of the undivided bladder is the rarest malposition of the bladder, and the only one in which the shape of the organ is not changed. So far as I know only three cases have been recorded; one by G. Vrolik, one by Stoll, and a third by Lichtenheim. In all three there was a vivid red, round tumor in front of the lower part of the abdominal walls, which in Lichtenheim's case could be replaced. After reposition there was apparent a sharp-edged aperture in the abdominal walls, of somewhat smaller dimensions than the tumor itself. The pubic bones were separated to the extent of two inches. With the finger in the rectum, the posterior bladder wall could be inverted into the tumor, and with the other hand the intruding finger could be recognized in the midst of the mass. Urine could be fully retained and was evacuated in a full stream. It was remarkable that the external surface of the bladder was apparently covered by a mucous membrane exactly similar to that clothing its internal surface. Microscopic examination demonstrated in this external mucous membrane the existence of convoluted glands lined with cylindrical epithelium. In G. Vrolik's case I am of opinion that there was no ectopia of the bladder at all, but rather a fissure of the abdominal walls, into which opened the dilated urachus.

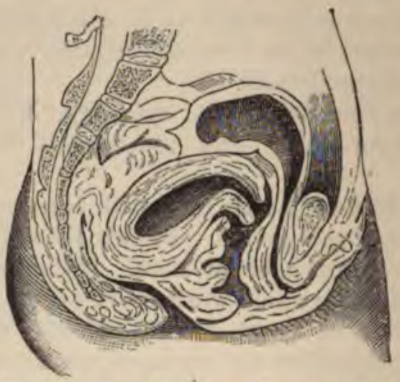

FIG. 25.—SHAPE AND POSITION OF THE BLADDER IN RETROFECTIO UTERI PUERPERALIS. (After *Schatz*.)

Fissure of the bladder is wrongly called ectopia by many authors. The dislocation is merely secondary. The malposition we are considering is to be exactly designated as *prolapsus vesicæ completus per fissuram tegumentorum abdominus s. ectopia vesicæ totalis.*

Lichtenheim's patient suffered no inconvenience save from the scanty secretion from the surface of the tumor, and no operation was undertaken.

If the vesical displacement cause pain and disturbance in the urinary function, it may be necessary to take measures to close the defect in the abdominal walls. The simplest plan is probably to follow Billroth's procedure for cases of eversio vesicæ. One flap, or if the defect be large, one from each side, is to be loosened (page 74), then slid over the bladder, and sutured there. The resulting covering is thin but tough, and it may be supported by a padded bandage.

Should the patient not decide to have an operation done, a suitable bandage may be employed to protect the bladder from excessive pressure. The bladder should be replaced, and the cavity filled with salycilated cotton, and the pad of a well-cushioned truss applied over it, the spring of which encircles the pelvis.

Another rare malposition, which at the same time changes the shape of the organ, is the prolapse of the bladder through the urethra; *inversio vesicæ urinariæ cum prolapsu, exocystis, cystoptosis.* Leveillé holds that not the entire thickness of the bladder-wall, but only its loosened mucous membrane appears in the urethra. But there has been found *post-mortem* in dilated bladders which were paralysed during life projections of the entire vesical wall into the lumen of the canal (Joubert, Rutty, Levret); and Meckel describes the appearance below the nymphæ of a triangular body, which examination showed to consist of all the coats of a prolapsed bladder. Burns also has proven that in these cases the entire bladder thickness is present, and thinks that the whole bladder can be everted before the mucous membrane could be loosened and prolapse. Streubel collected a series of recorded cases in which the entire bladder wall prolapsed, but only *one* in which the mucous membrane alone protruded.

The tumor is in the urethra and may project out of it. It is pigeon- to hen's-egg in size (Nöel), rounded, of a reddish flesh color, and occasionally granular. Sometimes we notice at the posterior portion of the tumor two orifices into which the sound can be passed, and from which the urine trickles (Crosse). It can, as a rule, be replaced without particular trouble. The urethra is naturally more or less dilated in all these cases, so that the finger can be passed directly into the bladder.

If we consider the normal figure of the empty bladder and its relations to the uterus (see Figs. 1 and 2), it is easily seen that the posterior vesical wall, which lies above the orificium vesicale, may be forced into the urethra by a certain amount of pressure coming from above where there is some relaxation of the walls of the organ and some dilatation of the calibre of the urethra. These three conditions are as necessary for inversion of the bladder per urethram, as they are for inversion of the uterus. The pressure from above may consist of an abnormal use of the abdominal muscles, of an over-filled and sunken cæcum, or of the uterus. In most cases the trouble begins gradually. It can only occur suddenly when for instance a pedunculated new growth suddenly prolapses through the urethra, dragging the bladder with it; or when, as in de Haën's case (see Streubel) the inverted bladder together with vagina and rectum prolapse in consequence of a sudden fall. It may occur at any time of life. Weinlechner saw it at 9 months, Oliver at 16 months, Crosse at 3 years, Streubel at 14 years, Thomson at 40 years, and Percy at 52 years.

The first symptoms, which in isolated cases may be present months and years before any others, are frequent desire to urinate, sometimes retention, and especially a sudden interruption in the stream. Then the patients notice, generally after an unusually persistent attempt to urinate, the appearance of a tumor. This tumor disappears at times, and then returns; and its return is accompanied with dragging pains in the hip and the back, and with fever. If the urine now collects in the bladder, and if the patient can withstand the tenesmus, as Percy saw, the tumor may gradually disappear, and the flow of urine begin. Sometimes, when the mucous membrane has become eroded, a few drops of blood may appear with the urine. As the tumor grows the troubles it causes increase, pain becomes severer, the appetite less, the kidneys irritable from the dragging upon and dilatation of the ureters. The patient becomes more and more emaciated, and dies of uræmia if her trouble is not relieved. It makes no difference in the symptoms whether the entire vesical wall, or only the mucous membrane, is prolapsed.

The recognition of inversion of the bladder through the urethra is not always easy. We must take into consideration the surface of the tumors (also its microscopic characters), their consistency, pedicles, ease of reduction, and finally the presence of the urethral openings. The finding of the latter of course render the diagnosis easy. If they cannot be found, the attempt should be made to replace the tumor with a catheter; and then from the vagina, or in young girls from the rectum, we can feel whether the vesical wall is thickened or not. If the vagina is large, and the inversion is chronic, we might attempt to replace the bladder from the vaginal vault, or to feel the depression. If we do not discover the nature of the tumor by these methods, we must endeavor to pass a finger into the bladder alongside the tumor, and try to find out whether we are dealing with a tumor springing from the inner surface of the bladder, or whether after reposition the prominence has disappeared. An overgrowth of the vesical mucous membrane, as Baillie has several times seen it, and consisting of mucosa, submucosa, and abundant fat has been observed by Patron in one case prolapsed through the urethra. Patron tied it successfully. Inversio vesicæ per urethram differs from prolapse of the urethral mucous membrane, in that the position of the lumen of the urethra, which in the latter cases is either central or in the upper part of the tumor, in the former may be shown by the catheter to encircle it. Besides this, the prolapsed bladder wall has a thick pedicle, whereas with prolapse of the urethral mucous membrane one is hardly demonstrable.

Therapy.—To prevent vesical prolapse we can treat the symptoms of dysuria and tenesmus vesicæ which usually precede it with warm baths, warm fomentations, inunctions with narcotic salves, (extr. opii gr. xxv.; vaseline ℥ i.), liniments (ol. hyoscyam ʒ i., chloroform gtt. xv.); and internally with almond milk, emulsions with extr. hyoscyami (gr. xxv. ʒ vi.), or with tra. thebaica. Or we may use per rectal injection 5, 10 to 20 drops of laudanum, and suppositories containing extract belladonna gr. iii and ol. theobrom. 30 grs. once or twice a day. These measures are usually sufficient so long as the urine is clear and the vesical mucous membrane not notably affected. If this latter does occur, we must use weak solutions of nitrate of silver (1-2-5:500) as injection, or salycilic acid (1-1000), or mucilaginous drinks, linseed tea, etc.

When vesical dislocation has occurred reposition must first be attempted. If the tumor be large, this may be attempted with the little or index finger, since the urethra will be so dilated as to admit them. If it be smaller, we must use a moderately thick and well-oiled catheter, and first compressing and replacing as much as possible with the fingers, shove back the rest of the tumor with the catheter into the bladder. If the patient presses down on account of the pain you cause, and renders the operation difficult, she should be anæsthetised. Any position will do; but one which renders the intra-abdominal pressure as small as possible is preferable. Hence the lithotomy position, or the knee-elbow position when no anæsthetic has been used, is the best.

To prevent a return of the prolapse the catheter might be left in place for a time; but it causes a good deal of trouble to many patients. It has therefore been advised to cauterize the neck of the bladder and the orificium vesicale urethræ, so as to cause increased contraction and vigorous resistance to further prolapse. But this is more uncertain and less pleasant than to effect contraction of the neck of the bladder, by the use of the colpeurynter, or cotton tampons, or Schatz's pessaries for incontinence of urine. If frequent relapses occur, astringent vesical injections should be used to overcome its relaxed condition.

Weinlechner claims to have prevented the return of the prolapse by means of sticking plaster; his patient was nine months old.

An operation is only to be thought of when the tumor is recognized as a polypus of the hypertrophied vesical mucous membrane. The method of extirpation will be described in Chapter IV.

CHAPTER XIII.

INJURIES TO THE FEMALE BLADDER.

Urinary Fistulæ in the Female.

WE owe a history of urinary fistula in the female to the critical industry of W. A. Freund; and we have one which is rare in medical history for its completeness. We have drawn largely upon his works. In the oldest medical writings we find no indications to show us that the physicians knew anything of urinary fistula. Impartial judges cannot admit the forced interpretation that would impute a reference to this malady to certain passages of Hippocrates. The Arabs wrote much upon incontinentia urinæ, but nothing in reference to fistula. Perhaps these lesions were rarer in ancient times, or went unrecognized, partly because delivery was easier, and partly because men were long debarred by custom from the practise of obstetrics and gynecology. Even much later men held the practise of obstetrics to be infra viri dignitatum. It was only at the end of the 16th and the beginning of the 17th century that we find urinary fistulæ mentioned at about the same time by several physicians; so that it is hard to decide to whom its first recognition is to be ascribed. In any case, however, we must first mention the name of Ludovicus Mercatus, a renowned Spanish physician, who in his work: *De communibus mulierum affectionibus,* 1605, devotes a long chapter to "fistulæ of the uterus," and not only describes the symptoms, but proposes a definite operation for their relief. Thus he says: Prima indicatio, quatenus ad affectum pertinent, docet callum prius conterere; nam cum ea quæ disjuncta sunt, uniri minime possint, callo in medio existente, curandum primo est, eum exstirpare. Orificio satis patulo, callum uno e tribus modis exstirpare poteris: medicamentis nimirum acrioribus et callum conterentibus, scissione ac avulsione calli et ultima partis inustione.

Further, Felix Plater in his work which appeared at Basel in 1625: *De mulierum partibus generationi dicatis,* mentions two cases of tearing of the neck of the bladder in difficult labors, notices the erosions of the vulva which occur with it, and names the remedy to be employed. (Lactis cremor et mucilaginosa). In a Paris thesis of Severinus Pinæus of the year 1597, urinary fistulæ are also mentioned. In 1606 Fabricius Hildanus mentions several noteworthy cases of the affection, and especially described a case in which a large vesical calculus gave rise to such a fistula. In 1664 Pietro di Marchetis strenuously urged the use of the actual and the potential cautery for these fistulæ, and obtained a complete cure in this way. As early as 1663 Hendrik van Roonhuyzen of Amsterdam had advised stitching for the cure of the affection; but like Mercatus he seems to have left the execution to others. More exact data concerning the malady we are considering are found in J. Varandaeus (1619), Ch. Völter (1687), Musitanus (1698), Mauriceau (1712), J. Fatio (1752), A. Levret (1753); and henceforward it is mentioned by almost all writers upon diseases of women and on surgery. But, as Freund says, there is a complete and surprising absence of any description of the malady in the larger pathologico-anatomical works of Morgagni and J. Lieutaud. In fact the pathology of urinary fistula was much neglected until very lately, partly no doubt because the patients were seldom the subject of *post-mortem* examination, and partly because all interest had long been centred upon the therapeutics of the disease. In this latter field the following names are to be noted: Desault, who at the beginning of this century again recommended cauterization, Dupuytren, who repeatedly used the red hot iron in 1820 with complete success; Dieffenbach and M. Chelius, Monteggia, Soupart, and Roubaix.

But a new era in the history of the operative cure of this malady was inaugurated by Jobert de Lamballe in 1834. The success obtained by this operator by his method, cystoplastie par glissement or autoplastie vésico-vaginale par locomotion, a procedure first proposed by Velpeau in 1834, attracted the attention of all Europe. From this time begins a rapid progress in the therapy of urinary fistula. One of the first to accept the method of the French surgeon, and to improve it, was Gustav Simon, then in Darmstadt, who had assisted Jobert in Paris at several of his operations. After him we may mention M. Sims and N. Bozeman as the two Americans who have carried the operative treatment of fistula to its highest perfection.

Stolz in Strasburg in 1828 first described the vesico-uterine fistula, G. Simon in 1856 first mentions the uretero-vaginal fistula, and A. Bérard in 1841 first mentions the uretero-uterine fistula. Finally, among the more recent and larger works upon this subject, are to be especially mentioned those of W. A. Freund (1862) and Ed. F. Bouqué (1875). The latter has especially corrected the misapprehension that Marion Sims specially improved the method for the cure of urinary fistulæ since he was the first to use the duckbill speculum to expose and operate on urinary fistulæ. Bouqué calls attention to the fact that Dr. Schuppert of New Orleans has proved that Sims's speculum is exactly like the speculum described by Metzger in 1846 in the Prager Vierteljahreschrift. For v. Metzger described a speculum as follows: A silver vaginal dilator, consisting of a guttered conical blade 5½ inches wide, whose lower ⅓ is turned outwards; and an 8. inch long steel staff, fastened at a right angle to the lower third, and provided for 5 inches of its length with a large wooden handle. Probably v. Metzger's invention remained unnoticed so long because he made no drawing of it. At all events, since it has been introduced there has been an important advance in the treatment of urinary fistula, since it renders possible complete exposure of the defect, and probably no fistula is operated upon to-day without its help. Thus to a German and not to Americans belongs the credit of this advance.

The Various Kinds of Urinary Fistulæ in Women.

Beginning at the external urethral orifice, the following abnormal openings between the urinary passages and neighboring organs may occur:

1. Urethro-vaginal fistula (Fig. 26), always situated at the lower end of the anterior vaginal wall, and opening into the urethral tubercle. Examples have been recorded in the literature of the last seven years by Aveling, Engelmann, Frissell, Grune, Péan, Verneuil and Winckel.

2. Vesico-vaginal fistula, which may occur at any point in the posterior vaginal wall from the sphincter vesicæ to the fundus (Fig. 26.) If the upper border of such a fistula lies against the cervix, it is called a superficial vesico-vaginal uterine fistula; if it pass through the anterior lip of the os, it is called a deep vesico-vaginal uterine fistula, both these latter being first named by Jobert.

If the bladder communicates with the vesical neck we have a vesico-uterine fistula. Ambrosio, Bozeman, Isenschmid, Lossen, Müller, and Winckel have within recent times published examples of this lesion. If the bladder has an abnormal communication with the rectum, it forms a vesico-rectal fistula (Heath); if there is an opening from the bladder into the small intestine, there is a vesico-intestinal fistula (cases of Krakowizer, Blanquique, and Valenta. Finally, if the urine exudes from an opening in the anterior bladder wall and the abdominal parietes, there is either a fistula of the urachus (page 68), or a cleft bladder (See Chap. I.) or a simple external vesical fistula.

3. The ureters themselves may be perforated, and may empty their secretions into neighboring organs. These urethral fistula do not indeed belong strictly under diseases of the bladder, but deserve mention among their complications. A ureteral fistula may open either in the vault of the vagina, uretero-vaginal fistula, or it may open into the cervical cavity of the uterus, uretero-uterine fistula (cases of B. Credé and Zweifel), or into the intestine, uretero-intestinal fistula, or outwards, external ureteral fistula.[1]

Here we have twelve different urinary fistulæ occurring in females; and we may in addition have various combinations of them. Thus we may have urethral with vesico-vaginal fistula (cases d'Ormea, Torreo, Freund, Simon, Engelmann (see Fig. 26), or vesico-vaginal with vesico-uterine fistula; or vesico-vaginal uterine with uretero-vaginal fistula (case of the author). There are also vesical, vaginal, and ureteral fistulæ where the vesico-vaginal wall is injured at the spot where the ureter lies between vagina and bladder (case of G. Simon.)

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[1] See case of G. Simon, which occurred after ovariotomy, and was cured by nephrectomy. Cf. Müller, Arch. f. Gyn., XV., 264.

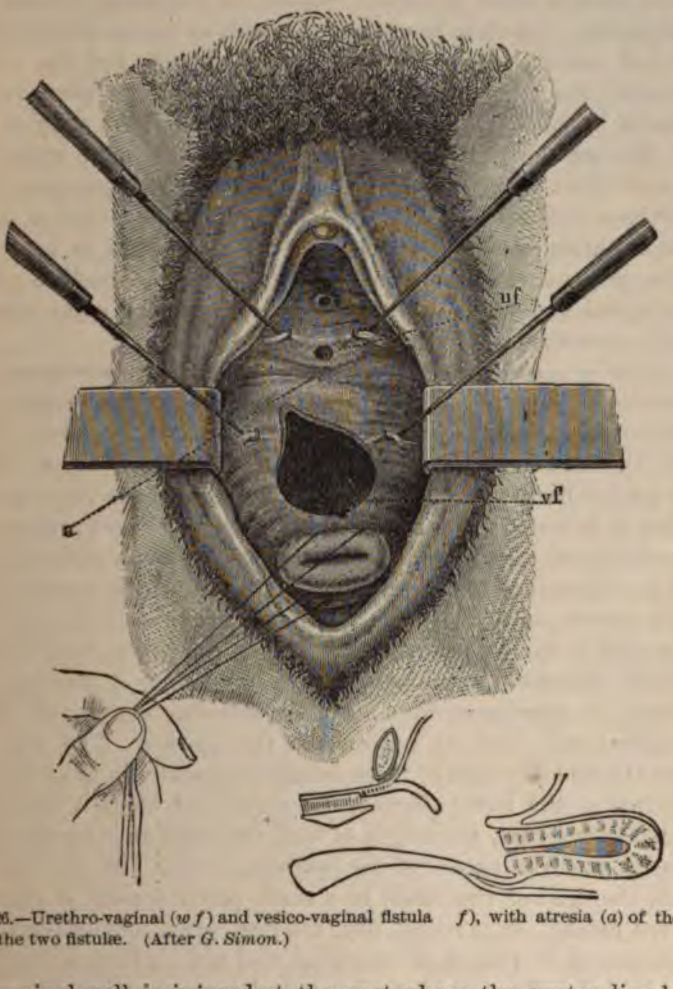

Fig. 26.—Urethro-vaginal (*u f*) and vesico-vaginal fistula *f*), with atresia (*a*) of the urethra between the two fistulæ. (After *G. Simon.*)

Finally, double uretero-vaginal fistula may occur, as W. A. Freund has first proved (1862).

We will now turn to the causes and origin of urinary fistulæ. As a rule their origin is quite clear. By far the greater part of them are due to malignant new growths of the genitals (see Introduction, page 25), and are not subjects for surgical treatment. Of those which do come under our care most are due to certain puerperal processes. The origin, the seat, the whole process in the walls of the affected organs are entirely different in the other cases. So we may divide urinary fistulæ into two great classes, puerperal and non-puerperal fistulæ. Puerperal urinary fistulæ are such as stand in causal relation to pregnancy, childbirth, or the puerperium. In these conditions the walls of vagina and bladder are swollen and vascular, their vessels are much dilated, and the veins are often ectatic; the union of bladder and vagina is more loose, and they are liable to be squeezed between any hard body and the margins of the pelvis. The causes which might work injury are also more active at this period, and affect larger areas of surface. Thus the puerperal fistulæ are sometimes enormous in size; and the hyperæmic condition together with the irritation caused by the lochial discharge, tend to keep up the ulcerative process. Puerperal urinary fistulæ may be urethro-, vesico-, uretero-vaginal and vesico-uterine fistulæ. They may occur spontaneously or in consequence of mechanical violence.

The following causes have been noticed as originating spontaneous puerperal fistulæ; rupture of the cervix and the vesico-vaginal septum when the head advances and the parts are rigid and cicatricial; cases of Berdot, Kiwisch, Detroit and others. The literature of this branch of our subject has been collected by F. L. Meissner and Duparcque-Nevermann.

Further to be noted are pressure effects when there are exostoses of the pelvic wall, vesical calculi, and carcinomata of the cervix and vagina.

Then the necrosis of gangrenous or diphtheritic parts, especially when there is a narrow pelvis, may occur. Simple necrosis during delivery of a woman with a narrow pelvis is common; in the other conditions it is rare, partly because the patients usually die before it can occur, and partly these processes most often affect the introitus vaginæ and the posterior vaginal wall, and do not disturb the bladder. The extent, the seat, and the time of origin of these fistulæ vary greatly in accordance with the structure of the tissue affected, the amount of blood it contains, its infiltration with serum, the length of time the pressure is continued, and its intensity, and the nature of the contusing body. So the contusions caused by the skull of the infant in a small pelvis appear as round and striped red patches, or as round, dry, colorless, gray, punched-out places. They are cast off by process of ulceration, and usually leave a circular loss of tissue behind. The seat of the injury varies in accordance with whether the contusion is at the entrance of the pelvis, or in the true pelvis. In the latter case it is usually close behind the urethra in the fundus vesicæ; in the former it is high up in the vaginal portion. A resistant and large head predisposes to the accident, as does hydrocephalus (case of G. Simon, Rostock. Krankenhaus, No. 3; case of author, see below), and faulty position. A pendulous abdomen also predisposes, though not to the extent that Esmarch would have it. The mechanical hindrance which a narrow pelvis presents, cannot be so easily overcome as can that caused by a pendulous abdomen; in fact the latter is usually in a relaxed condition due to the presence of the former. Schatz maintains that the expulsive force is exerted mainly by the abdominal walls, but it is not to be doubted that the uterine muscle does take part in the crushing of the soft parts. Face presentations often cause urinary fistulæ (cases of Schupp, Danyau, craniotomy; Metzger, cases 26 and 33 of Simon, and cases 2 and 17 of the author); the sharp edges of the child's face being very apt to do damage, especially as the presentation usually occurs with contracted pelves. Hecker claims that unusual height of the pubic symphysis also predisposes to abnormal pressure.

Several spontaneous fistulæ may occur at the same time. In the author's case, No. 7, there were 4 openings. Here the gangrene occurs from pressure successively or simultaneously applied to different portions of the soft parts, and even if only one part is implicated, the pressure may have been uneven, and bridges of living tissue be left, so as to give us several orifices.

There was a time when the occurrence of vesico-vaginal fistula was supposed to be largely due to the execution of certain obstetric operations, and especially to those that involved the use of the forceps. In 1828 W. S. Schmidt vigorously combatted this prejudice, and claimed that the accident would be of far less frequent occurrence if there was not such an ingrained fear of the use of the instrument. Even the teachings of the schools inculcated a reluctance to use the instrument which was a direct cause of the evil which it was sought to avoid; since in by far the greater number of cases it is the continued pressure of the impacted head which causes the fistula. We are not so much afraid of the forceps now. Ch. West (1858) and G. Simon and Baker Brown have recorded it as their opinion that in most cases it is the postponement of instrumental assistance in tedious labors which causes the lesion. Perhaps the truth of the matter lies between these two extremes. In Bouqué's collection of 204 different fistulæ, 118 occurred after labor; of these latter 65 or 55 per cent., more than half, were instrumental confinements. I have myself operated upon a large number of fistulæ in cases in which delivery had been effected by artificial means, and in almost every case it could be satisfactorily proven that the operation was the cause of the fistula. This can only be decided by a thorough consideration of the seat, size, shape, and edges of the loss of tissue. The presence of extensive scars or adhesions, or of stenoses or atresias of the vagina, will render probable the injury of the parts by the forceps themselves. In 28 cases of vesico-vaginal fistula upon which Spiegelberg operated (Landau, p. 343), 22 occurred after instrumental labors, 17 were in primiparæ, 11 in multiparæ, and half of all the cases had stenoses, cicatricial bands, and atresias. The fistulæ occurring after normal delivery are mostly situated in the upper part of the vagina, and are either superficial or deep utero-vesico-vaginal fistulæ, or utero-vesical fistulæ. Thus in 15 cases of uterine fistula that Spiegelberg operated upon, 12 were after simple, and 3 after instrumental deliveries, 12 were primiparous and 3 multiparous. As complicating causes we may mention premature rupture of the membranes, non-dilatation of the cervix in spite of long-continued pains, and in the deep utero-vesico-vaginal fistulæ, tardy opening and canalization, especially in cervices ruptured at earlier births. Naturally the existence of these conditions cannot always be ascertained by observers who were not present at the delivery.

Urinary fistulæ due to violence may occur *inter partum* from instrumental or manual interference. In Bouqué's 65 confinements before mentioned, 37 were delivered with forceps, 7 with the lever, 12 by cephalotripsy, craniotomy or embryotomy, and 3 by the blunt hook; turning was employed 5 times. The forceps may cause a fistula directly or indirectly; directly, by cutting the vesico-vaginal wall with its sharp edges as it is drawn out, by their use before the os is sufficiently dilated, by too rapid change from one position to another, or by rotating them upon their longitudinal axis to alter the position of the head. If the instrument lie in the oblique diameter of the pelvis, the anterior blade may cut the vesico-vaginal septum; if it lies transversely, it may cut the sides of the vagina. Cuts in the vaginal walls made by the forceps are often found, even after easy operations. They appear as cleanly marked cuts 1 to 2 inches in length, and mostly in the posterior wall, being caused by the hinder surface of the blades as the handles are being elevated. Less often we find them at the sides, just behind a point opposite the place of union of pubes and ischium. In these latter cases, as once happened to me in spite of the greatest care, and an easy and strictly lege artis extraction, the vesical wall is often injured. The case of childbirth recited in the appendix was in my presence ended with the forceps by my assistant, on account of danger to the child; yet a cut was made upon the right side. A single application of liquor ferri sesquichlorati to the small fistula sufficed to cure it. The fistulæ caused by the forceps are, as we have said, usually in the lower third of the vagina, and are often greatly complicated, since they are mostly due to pressure-necrosis. But direct cuts and tears are not of rare occurrence. Thus I operated upon two patients in both of whom one and the same surgeon had torn the vesico-vaginal septum upon the left side from the vault of the vagina to within half an inch or so of the orifice of the urethra.

It has occasionally occurred that one blade of a forceps has pierced the vaginal vault; the same thing has also happened with the scissors-shaped perforator. The parturient parts have often been torn with the sharp hook, as also by the use of the cranioclast (see Saxtorph's case). Turning may cause injury to the bladder by the hand being forcibly passed through the cervix before it is sufficiently dilated; as also when, as Spiegelberg, *horribile dictu!* proved in one case, the hand of the accoucheur is introduced into the urethra instead of into the vagina; and finally, when version is difficult, though the foot has been seized, the attempt to drag it down causes too great friction and pressure upon the anterior pelvic wall. After version is completed, extraction may cause vesico-vaginal fistula, either by tearing or by gangrenous destruction from pressure. The uretero-vaginal fistulæ occurred in all cases so far known (Simon 2, Alquié, Panas, Landau, and my own) after deliveries ended by operation; and Landau is certainly right when he ascribes them to the interference. I also observed a fistula of this kind, which had been caused by a pessary. An injury to the ureter near the fundus vaginæ, appears to be only possible when it has been fixed by precedent parametric inflammation, and suffers a direct injury from some instrument.

A well-known German gynecologist lately told me that once, while operating upon a ruptured cervix with Greenhalgh's instrument, and without the blade being set very far out, he caused a uretero-uterine fistula, which, however, happily soon healed under tamponade of the cervical canal. According to Bandl, Bozeman wounded a ureter in two vesico-vaginal fistula operations by enclosing them in a suture, and thus causing fistula of the ureter.

Forced catheterization during labor may perforate the bladder from within outwards, as occurred in Dieffenbach's case. The bladder has been repeatedly incised in the operation of synchondrotomy during labor.

The only remaining causes of fistulæ are the ulcerative or so-called diphtheritic processes which occur in the vagina of puerperal women, and perforating ulcers of the bladder. Carcinoma, para- and perimetric processes, and ovarian abscesses not infrequently break through the vesical wall. Fistula may occur, though rarely from these causes; thus in the case of Hamonic already cited, an ulcerative inflammation of the urethra caused a urethro-vaginal fistula.

In my 14 cases the fistula occurred: without use of instruments, once (No. 10); without instrumental violence twice (Nos. 4 and 13); probably through the use of instruments 3 times (Nos. 1, 2, 14), and almost positively through their employment 8 times (Nos. 3, 5, 6, 7, 8, 9, 11, 12.)

The non-puerperal urinary fistulæ may also be either due to violence, or they may occur spontaneously, from certain morbid processes. The first class may be caused by perforation with the sound, with the lithotriptor, or by other foreign bodies, especially hair-pins. A fall upon a sharp body, as upon the pointed stake of a fence, etc., may cause fistula; or puncture of the bladder in retention of urine, due, for instance, to retroflexio uteri gravidi, or an accidental wound in vaginal puncture of the ovary may cause it. It may follow lithotomy. Further, the bladder may be injured in amputatio calli uteri, in prolapsus uteri; also in ovariotomy, and, as the cases of Dieffenbach and W. A. Freund teach us, in the attempt to open with the knife an imperforate vagina.

Mittelhäuser claims that the forcible passage of a finger into the urethra has caused incontinence. It is well known that fissures may be caused in this way; but that by the passage of one finger the entire urethra may be torn through to the bladder, and the bladder wall then also perforated in the same manner, seems almost impossible. For I have often made digital exploration of the inner surface of the bladder, when the urethra in spite of specular dilatation still offered great resistance, and have caused no tear. Still less likely is the occurrence of a fistula by concubitus violentus, as Munnik has claimed. A blunt body like the male penis can hardly tear the walls of so dilatable a cavity as the bladder, either per vaginam or per urethram, even in the case of a rape committed upon a girl six years old, as in Pollak's case.

On the other hand it is not infrequently observed that large and sharp-edged pessaries, or those left too long *in situ*, have caused perforation of the vesico-vaginal septum. The cases of Fabricius Hildanus, Breschet, Bérard, Dupuytren, Dieffenbach, Lisfranc, Busch, and others prove this. Erosions occur in the most tensely stretched portion of the vaginal wall, then ulcerations, and finally the pessary breaks through into the bladder, and occasionally into the rectum at the same time. Zwanck's pessaries are especially dangerous in this respect; I have seen one and Pagenstecher has seen two cases of vesico- and recto-vaginal fistula caused by them.

Ulcerative malignant processes may cause fistula in carcinomatous disease of the uterus and the vagina. Statistics show (see page 25) that half of these patients eventually suffer from perforation of the bladder; and most frequently the vesico-vaginal wall suffers. In hardly 20 per cent. of the cases does the new growth destroy the utero-vesical junction.

It is doubted by many whether tubercular or syphilitic ulceration can cause urinary fistula. The pulmonary and intestinal complications progress more rapidly than do those of the urinary organs, and we sometimes seem them causing hypertrophy of the vesical wall. A case of W. A. Freund teaches us that specific vaginal ulcerations may cause urethro-vaginal fistula, and one of Beckwith's shows us that they may cause vesico-vaginal fistula.

Among the diseases of the bladder, which may cause spontaneous vesico-vaginal fistula, the most important is stone in the bladder. (See Chap. VI.) Others are: chronic ulcerative vesical catarrh with diverticulum-formation; and carcinomatous degeneration beginning in the vesical mucous membrane.

Finally we must remember that disease in the neighborhood of the walls of the bladder occasionally causes fistula; pelvic abscesses may perforate both bladder and vagina; hæmatocele may do the same, and so also may ovarian abscesses, and those due to an extra-uterine pregnancy (see cases of Simpson and others).

The Anatomical Relations of Urinary Fistulæ in the Female.

We must now more minutely specify the exact seat, size, form, and edges, etc., of the abnormal openings which we have been considering. We will begin with the seat, upon which often depends the shape. The urethro-vaginal fistulæ are usually placed in the middle of the lower wall, are round, from a hair to a bean in size, and are rather orifices than canals. Only very exceptionally are they cross rents, as in a case of Freund's, and in mine, No. 12. Freund has also given us an example of a perforation caused by syphilitic ulceration of the introitus vaginæ. The vesico-vaginal fistulæ are situated as a rule at one side of the lower third of the vagina when caused by operative procedures, and nearer the laquæ vaginæ when occurring spontaneously with contracted pelvis. It is not certain that they occur more often upon the left than upon the right side, though this is claimed by Simon, Neugebauer, Jarnatowski and Spiegelberg (Archiv. VII., 346). As in so many other cases, this assertion has been based upon the analysis of only a small number of cases. G. Simon found it so 10 times in 17 cases, but adds "or at least they extended more to the left than to the right side."

Their shape is variable. The smaller are circular or oval; and oval especially when they are fixed to one or other rami of the pubis by cicatricial bands. Busch found those situated near the sphincter vesicæ, to be half-moon shaped, with the concavity directed forwards, on account of the action of the transverse muscular fibres. Others again are mere fissures; and these fissures may vary in size from a slit so small, or so imbedded in a carcinomatous or other growth, as to be invisible, to openings large enough to pass several fingers through. But both size and shape vary with the time that has elapsed since they first appeared. As a rule, they are the larger the more recent they are; in the older ones cicatricial contraction of the fistula itself, together with vaginal stenosis, which may go on to the extent of complete atresia, (comp. Fig. 28) tend to diminish their calibre.

Uretero-vaginal fistulæ are situated at one side in the vaginal vault, or at its posterior portion; or they may be in front and above the left half of the posterior lip, the anterior having been destroyed, and the ureter being drawn to the right by cicatricial contraction. The size of the ureteral opening is of course small, though a sound can easily be introduced into it; its shape is round. In my case the mouth of the ureter formed a button-like prominence, from which the urine flowed in a thin stream as the speculum was moved about. Busch, l. c. p. 77, mentions a case from B. S. Schultze's clinic, in which two small fistulæ of the right ureter were attached to the right pelvic wall. W. A. Freund has observed a case in which both ureters were involved in the destructive process. The fistula was seated in the median line, was elliptical, being 1⅒ inches long, ⅘ inch wide, and distant from the uterus ⅕th inch, and from the external meatus ⅘th of an inch. The terminal portions of both ureters had been destroyed for ⅕ of an inch; they projected as round prominent openings into the lumen of the fistula, and were visible in the vagina. (l. c. p. 61).

The latter variety of uretero-vaginal fistulæ, which occur in that portion of the bladder corresponding to the trigomon, and are always found in connection with a partial destruction of the vesical wall, should be designated as the lower variety; for they differ both therapeutically and prognostically from the kind described before as occurring in the fundus vagina, which may be called the upper variety. Simon found such a one on the left side, ⅖th of an inch from the os and 2⅗th inches from the external urethral orifice. The fistula was ⅒ x ⅕th inch in size, and the left ureter, which could be reached with the sound, was destroyed for its lower ⅕th inch.

The position of vesico-utero-vaginal fistulæ (see Fig. 53, *a* and *b*) is described by the name. They occupy the vault of the vagina, are round, or quadrangular, and not large as a rule. The deeper ones, where the anterior lip of the cervix is destroyed, are not much larger, since the posterior lip is often also involved. As a rule, both are median, since with a contracted pelvis the chief pressure is upon the middle of the anterior pelvic wall.

The utero-vesical fistulæ are situated ⅕ to ⅖ of an inch from the external cervical lip, either in the median line, or to one side. They are usually as large as a pea or bean. Only in rare cases are they found combined with deep utero-vesico-vaginal fistulæ, being divided off from it by a thin, narrow bridge of tissue. The uretero-uterine fistulæ are very rare, and are usually so small as to be hardly visible to the naked eye. The former are placed more in the middle of the anterior wall, while the latter are placed at the sides, and somewhat forwards. The three cases observed respectively by Bérard, Puech, and Freund did not any of them come under *post-mortem* observation.

The vesico-intestinal fistulæ are situated as follows: the vesico-rectal, the vesico-intestinal, and the vesico-ventricular are of course situated on the sides, posterior wall, or vertex of the bladder. Long fistulous tracts may arise. A coil of the small intestine may adhere to the bladder, and perforation occur at the point of adhesion; or an inflammation of the pelvic cellular tissue may perforate both bladder and rectum.

Finally, the urinary fistulæ of the anterior abdominal wall, the external urinary fistulæ, form longer or shorter channels or slits, as we have seen when considering version of the bladder.

The edges of the fistulæ are at first usually swollen, uneven, infiltrated, tender, and bleed easily when touched. Gradually necrotic portions are cast off, secretion diminishes, the margins become firmer, and the vaginal pavement epithelium grows over the edges of the wound. A connective-tissue proliferation now takes place between the bladder and the vaginal wall, and the edges of the fistula become thinner, indurated and tense. Thus Freund proved in a carefully observed case, that the bladder was adherent to the vaginal wall for a concentric ring 2 to 3 lines in width. Microscopically, we see abundant connective-tissue proliferation between the adherent portions of the two organs; the muscular layer and the mucous membrane become thinner as you advance nearer to the edges of the fistula, the papillæ are less marked, until at $\frac{1}{25}$th inch from the edge of the orifice, the entire thickness consists of a hard, cartilaginous-like and poorly vascularized connective tissue, in which we can still recognize some remains of the degenerated mucous membrane. Of course the extent to which these processes advance depends largely upon the cause of the fistula. If there has been but little contusion, or perhaps only a simple cut, the vitality of the margins is better, the lips of the wound are thicker, the granulations are more vigorous, the scar is smaller, and the neighboring tissues are less implicated. I might refer to cases that I have myself seen, where the fistula was caused by a forceps blade, and where months later the edges were as described; or I might mention Bouqué's case (l. c. 1875, p. 124-125), of which he says: "les bourgeons charnus sont tellement volumineux, qu'ils arrivent au contact en faisant pont au dessus de la trouée anormale, etc."

On the other hand, there seem to be some special causes which tend to cause the thinning of the edges of the fistula above described. Thus tension of the edges caused by contracting cicatricial tissue, and especially fixation of the edges of the fistula to one or other of the bones of the anterior pelvic wall, appear likely to do so. And if, as sometimes occurs, inflammatory processes in neighboring organs cause tension of different parts of the border in different directions, it is easily understood how thinning from tension may occur.

In the non-puerperal fistulæ, the condition of the edges is of much less importance, and indeed depends mostly upon the nature of the cancer, perforating calculus or foreign body which cause them.

After a urinary fistula has existed some time, there occur certain changes in neighboring organs, in the urinary organs, in the genitals, and even in more distant portions of the pelvis. The most important change in the urinary organs is the change in the urethra; the urine no longer passing through it, it becomes smaller and smaller, is gradually obliterated, and is said in some cases to have been difficult to find at all. (?) As examples of this we may cite the cases of W. A. Freund, Hoffmann, Lancerotte, and G. Simon (5 cases, 29, 30, 31, 32, 33=12 per cent. of all cases.) The bladder also diminishes in size, the walls come in contact with each other; as a rule the anterior wall covers the fistula, and may even prolapse through it to the extent of becoming visible in the external genitals. It is usually in a hyperæmic and catarrhal condition, and sometimes (as in W. A. Freund's case) has polypoid growths upon its surface. It may become adherent to the posterior vaginal wall (case 39, Simon). The vesical muscularis is generally hypertrophied, and the serosa is sometimes injected; and pericystitis with perimetritis may cause varying adhesions between the two organs.

The ureter is often involved in the changes of shape, position, and tension of the fistulæ. If it is torn across, the lower end will atrophy like the urethra; cicatrization will approximate it to the ureter of the other side. Its wall will usually be thickened on account of the inflammation of the subserous tissue; and the canal will be dilated above the thickened part. The kidneys are also very liable to suffer, especially in uretero-vaginal fistulæ, since injurious matter can most easily reach the pelvis of the kidney from the vagina. The case of B. Credé is noteworthy in this respect, he finding the extirpated kidney belonging to the injured ureter in a high state of interstitial nephritis. Verneuil has very recently paid particular attention to this subject.

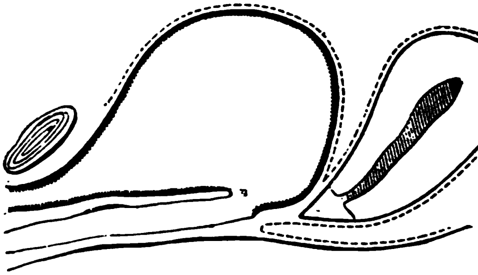

FIG. 27.—ATRESIA OF THE VAULT OF THE VAGINA. (After *Hegar*.)

The external genitals are continually moist, pale bluish red in color, eroded in places, and sometimes secreting pus. After the fistula has existed for some time, we often find small flat tumors, hypertrophies of the papillary bodies, pointed condylomata and excrescences. (Cases of Hoffmann and G. Simon.) In recent cases the vagina is hyperæmic, swollen, and dilated; when much scar tissue is formed it is often stenosed, and at times the seat of complete atresia (Fig. 27). Thus in one of Freund's cases the lower part of the vagina was much narrowed by cicatricial tissue; then came a wider portion, containing the vesico-vaginal fistula, and then above this was another stenosed portion, from which urine also flowed. The vaginal contracture and irregularity may be so great as to render it difficult or even impossible to find the cervix and fix the position of the uterus. Erosions of the vaginal wall also occur. In old large fistulæ we not infrequently find the vagina relaxed and dilated, pale in color, and with its epithelium very like that of the epidermis. If the fistula is near the uterus, or involves that organ itself, the lips of the uterus are swollen, eroded, and covered with weak granulations. The lower part of the organ is chronically inflamed, partly from constant contact with urine, partly from the same influences that caused the fistula, and partly from the resulting cicatrization, which dislocates the cervix and causes disturbances of circulation and position. The subserous connective tissue and the serosa of the uterus often participate in these chronic or subacute inflammations, and abscesses around the cervix and perimetritis with fixation of the uterus are apt to occur. The anterior layer of the omentum may fall down into the neighborhood of the fistula and adhere, as G. Simon has first shown us.[1] He lost such a case (No. 4) 14 days after the operation from peritonitis, the fold of omentum being included in the sutures.

It remains to note that with urinary fistulæ stony concretions and even full-sized calculi may form in the bladder, in the vaginal pockets, in the uterus, and in the external genitals. (Petit, Wendt, Saxtorph, Böck.) Thus the ligatures of a partly healed operative case may become covered in a few days, and in rare cases the salts form a crust over the surface of the vaginal canal. Simon's experience is that calculi occur oftenest in fistulæ when there is at the same time vaginal stenosis below its orifice; he never found one with a simple fistula, save when a foreign body was present. The urine stagnates in the diverticulum, and causes deposit of the lime salts, especially around their orifices; and from here it spreads over the interior of the vagina and bladder. Among 42 patients Simon could find only 1, number 38, where there was a large vesical calculus several years after the delivery which caused the fistula.

The Symptoms of Urinary Fistulæ.—Any opening of the kind under consideration will of course be at once followed by the outflow of urine through the vagina and vulva. This may even occur before delivery, if the slipping forceps incise the bladder. This outflow, however, is often not noticed either by physician or patient; the pain incidental to delivery and to the operation, and the flow of liquor amnii and blood, suffice to hide what has occurred. But after several days, when pain and hemorrhage has ceased, it is noticed that there is never much desire to urinate, and that very little is spontaneously voided, and that the lochia have a urinous odor. In the worst cases the signs of the vesical lesion are at first entirely covered by the general puerperal symptoms; for the patient is feverish, and does not always pay proper attention to the condition of the lochia. The case is different when the fistula is caused by pressure necrosis. There is moderate pain in the vagina, difficulty or inability to pass water, moderate fever and general unrest; a combination of symptoms not at all characteristic. But when a portion of crushed and necrotic tissue suddenly gives way before the urinary pressure, and a large amount of urine is voided through the vagina, the vesical distress suddenly ceasing, then the characteristic picture of urinary fistula is developed. But the symptoms depend largely upon the size and seat of the fistula, the length of time it has existed, the amount of reaction shown by neighboring tissues, the complications, and the patient's constitution. Even the first and most important symptom, involuntary discharge of urine, is extremely variable; for in urethro-vaginal fistulæ it is not involuntary in regard to time, but in regard to direction, the stream being directed backwards and downwards, and into the vagina. In vesico-vaginal fistulæ it may flow by drops, or in a stream, continuously, or with longer and shorter interruptions. The flow is permanent if the orifice is large, unless there be stenosis of the vagina with calculus formation. When the orifice is in the vaginal vault the flow is often voluntary and involuntary; voluntary when the patient is in the erect position, the lower portion of the bladder being filled with urine, and the patient micturating at will; involuntary when she is recumbent, the water flowing out directly through the fistula. In utero-vesical fistulæ the same is the case; and since the orifice of communication is usually small, the amount of urine voluntarily emitted is considerable. I operated upon one case with a large vesico-vaginal fistula (case 11), only a lentil-sized fistula being left at the orifice of the urethra; in twenty-four hours she spontaneously evacuated 41 ounces of urine, losing a small quantity at night drop by drop.

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[1] Rost. Krankenhausbericht, p. 155.

If the uterus is moderately movable, the edges of a fistula in the vaginal vault may be dragged into approximation when the patient stands up, and the involuntary flow of urine greatly diminished. In the isolated uretero-vaginal fistulæ but little urine escapes per vaginam, and that only occasionally; besides this, the patient can regularly evacuate what urine accumulates in the bladder.

If the amount of the involuntary flow is considerable, the above-mentioned changes in the neighborhood of the fistula occur, though in cleanly persons they may be warded off for a considerable time. The more marked they are, the greater the disturbance of the functions of the genital apparatus do they occasion. Menstruation may be absent, irregular, or painful; but it may also be quite normal. It is natural that there should be a certain distaste for cohabitation on the part of both husband and wife; the woman dreads the pain, and fears another conception. C. v. Braun claimed that a fistula caused sterility; but Simon, Schmidt, Freund, and others have disproved this. But Simon believes that when it does occur under these circumstances, an abortion or a premature delivery is the result. A case of Schmidt, and one of the author's, show that this is not always so. In fact, my father had a case in which pressure at the same spot of a child at term at the next confinement caused the fistula, due to the previous one, to heal. We must admit that conception is rarer among these patients than in healthy persons, for few patients with fistula become pregnant; but some do. I mention a patient in my *Berichten und Studien*, (Vol. II. p. 129,) who had a very considerable vesico-vaginal fistula, and in whom after an unsuccessful attempt to secure direct union transverse obliteration had been done. This was not entirely accomplished; a small opening was left, and through this coitus was accomplished during a short visit which she made to her home. She aborted at the 5th month. In the same volume on page 79 is recorded the confinement of patient No. 931 (1874) with an unviable and macerated girl; a cephalotripsy done 4 years ago had occasioned 4 fistulæ, and there were a large number of cicatricial bands in the vaginal vault. Nevertheless she conceived again. Naturally, succeeding pregnancies may enlarge the fistulæ, or delivery may be hindered by the cicatricial bands, etc. In the last-mentioned case air entered the gaping cervical vessels, and the patient died four hours after delivery. The puerperal period may be greatly influenced by the recrudescence of subacute inflammatory processes in the neighborhood of the uterus. As a rule a new pregnancy means increased trouble and greater danger for the patient.

On the other hand K. Schröder maintains that the power of conception is not much altered in women with urinary fistulæ, and the ensuing pregnancies and deliveries are normal. Kroner's thorough investigation of sixty cases of fistula in the Breslau Klinik do not confirm Schröder's statements. He found that menstrual disturbances frequently accompanied the affection. The periods often ceased entirely, or only began some time after delivery, or they were irregular and painful. In only 23 per cent. were they normal. 6 cases only conceived; and in all the literature of the subject he only found 37 cases of fistula that did so, including these 6. This small number alone, among the hundreds of cases of fistula which have been reported (Bouqué alone cites 639 operated upon by suture) proves the rarity of conception in these cases. Among Kroner's 37 cases 21 were pregnant once, 12 twice, 3 three times, and one had a series of children. 36 of them bore 54 children; 9 only went to full term, and 23 suffered from abortion or premature labor. There was much variation in the exact mode of birth; but the number of cases was too small to draw any definite conclusions about. Out of 9 cases in which the fistula was subsequently examined, 8 were unchanged, and one considerably enlarged. Finally, in 37 confinements, many of which were premature, there were 2 deaths, a high percentage.

When the fistula is small, high up, and there is but little loss of urine, the general health may be entirely unimpaired. I have seen patients who not only did not suffer in their nutrition from pretty large fistulæ, but who could not make up their minds to undergo the operation necessary for their cure. But these are exceptions. The constant wetting, the urinous odor, the excoriation and pain around the genitals, the loss of appetite, the disturbed sleep, the frequent colds, eventually cause loss of strength, a gray anæmic appearance, and melancholia; the patients become a nuisance to themselves and their friends, and readily submit to repeated operations in the hope of cure.

One symptom remains to be mentioned of which different explanations have been given; that is constipation. Jobert believes it to be due to a tonic contraction of the rectal muscular fibres from the irritation caused by the flow of urine. Freund believes that increased urinary secretion is caused by the ready outflow (as occurs in other secreting organs under like conditions), and hence the sluggishness of the bowels. Although Schäfer (Giessen) has proved that there is such an increase, it is so small (2 to 5 per cent.) that it can hardly be the cause. It is probably due to want of exercise, depressed spirits, the puerperal state, and the anæmia resulting from these various causes.

Death rarely ensues in consequence of urinary fistula. These women live on miserably year after year until they are either cured by operative procedure or they die from some intercurrent disease. In one of my cases a pleuro-pneumonia with subsequent phthisis followed within three months of her confinement, and carried off the patient before any operation was done (see Köhler's case, 7).

Diagnosis of Urinary Fistula.—As soon as a women who has had a severe confinement, or has cancer, or has had some operation like removal of the portio vaginalis with écraseur or galvano cautery, begins to complain of trouble in making water, a thorough examination of the entire genital system should at once be made. It might of course be possible to detect by touch a necrosed spot in the vesico-vaginal septum from the pain occasioned by pressure there, and thus the existence of a fistula be suspected; but as a rule the task of determining the exact seat, size and complications of the fistula is not an easy one. If it is half an inch or more in size, and if it is situated in the anterior vaginal wall, digital examination, and the passage of a catheter into the bladder and through the fistula into the vagina will suffice. But if the fistula is situated to one side, and is small, or perhaps is placed in the depths of a forceps-cut, the task is much more difficult. The finger does not recognize it, nor can the catheter be passed through it. The bladder must be emptied by the catheter, to find out if there is any urine in the organ, and if there is whether it is bloody or not. If none is found, the patient is to be forbidden to urinate voluntarily for one or two hours, and dry napkins laid under her. At the end of that time the catheter is again passed, and any urine obtained is to be quantitatively and qualitatively examined. If there is still doubt, Simon's speculum and the duck-billed instrument for the posterior vaginal wall is to be employed, the mouth of the womb accurately and firmly closed with a plug of white cotton, and 8 to 12 ounces of some dark-colored fluid poured gradually into the bladder with a Hegar's funnel through a clean catheter. Close observation of the anterior vaginal wall will inform us whether any fluid passes or not. If such an exuding spot is found, it is to be immediately fixed with small hooks, and an attempt should be made with the sound to penetrate through the fistula into the bladder. Milk, or a solution of permanganate of potash are the best fluids to use for this purpose, and of course the anterior vaginal wall should be well dried beforehand, so that the smallest quantity of fluid may be recognized.

If not a drop flows into the vagina, there cannot be a vesico-vaginal fistula; but there may be a vesico-uterine fistula. The plug is now taken out of the cervix, and, if there is such a fistula, the white cotton will be found to be colored, and the dark fluid will exude from the os uteri. The cervical canal can then be rapidly dilated with metallic dilators or an appropriate speculum, or the commissure may be incised, so as to expose its inner surface to view.

If the fluid pass through neither of these channels, and if it is certain that there is an involuntary loss of urine, a fluid containing urea flowing into a clean porcelain vessel when the urethra is closed by a solid bougie, there can only be a uretero-vaginal or a uretero-uterine fistula. In the first case there will be near or behind the vaginal portion a little orifice, or a button-shaped prominence with a hole in it; into this the sound can easily be passed for a certain distance upwards and backwards; and careful examination will reveal the fact that a clear fluid flows in varying quantity from the orifice.

If, when the cervix is tightly plugged, the vagina remains quite dry, there can be no uretero-vaginal fistula. Is there a uretero-utero-cervical fistula? There is, if the fluid issuing from the cervix is distinctly proven to be urine, and if the fluid is *not* colored by injection as above into the bladder. If, as is often the case, the vagina is so stenosed that the finger cannot be introduced, the colpeurynter or compressed sponge or incision must be employed, to be followed by Simon's urethral specula, and the finger.

Finally, there remains another method of diagnosis, the rapid dilatation of the urethra with specula, and the subsequent palpation of the inner surface of the bladder. Simon has in this way (Publ. No. 10) several times determined the exact size and boundaries of vesical fistulæ. But small fistulæ can be felt but with difficulty or not at all, as I saw myself only lately in one which was situated far to the left side.

In the same way we can examine whether any other organ, the ovary, the processus vermiformis, or the small intestine communicates with the bladder, our attention being directed to these points by finding pus, or hair, or remnants of food in the urine; to which points we will return later. It will also enable us to decide whether substances found in the urine come from neighboring organs, or whether they are portions of tumors of the inner surface of the bladder. When we cannot insert the finger into the orifice we feel, we may be able to pass an elastic catheter alongside it through the opening. We may thus obtain some of the secretion of the part and directly apply treatment to it.

The fistula once found, and its seat exactly determined, the nature of its borders, their fixation, tension, and direction is to be considered, the condition of the uterus looked to, not forgetting to search for more than one fistula. In difficult cases repeated examinations will be necessary, and chloroform will have to be used in sensitive patients. We will use, according to circumstances, Simon's dorsal, Bozeman's knee-elbow, or the Sims-Emmett side position, selecting that one which renders the fistula most clearly visible. Only after a most thorough inspection and palpation will we be in a position to give a correct prognosis regarding its fistula, and to take proper means for its cure.

Prognosis.—Urinary fistulæ are always serious maladies, since they exercise a deleterious influence upon the patients' health, and render their condition a most uncomfortable one. It is true that spontaneous cure may occur. Bouqué (l. c. p. 86 to 87) has found 60 such cases recorded, including even fistula into whose vaginal opening 1 or 2 to 4 (!) fingers could be passed.[1] Some of these cases had existed for months and years. Thus a case of F. Hildanus had lasted 8 years, one of Duparcque's 4 years, one of Zechmeister's 4 to 5 years, one of Ehrmann's 14 months, and one of Conradi's 6½ years. The author himself records two cases of small fistula in the appendix, which even both healed in 14 days; one spontaneously, and the other after a single cauterization with liquor ferri sesquichlorati; and he can add two cases of spontaneous cure from the practice of his father. Leishman observed a case of vesico-uterine fistula, in which spontaneous cure occurred in consequence of inflammatory atresia of the cervical canal. But a spontaneous cure is very rare, and therefore every case of this kind is recorded. In cases where a calculus caused the fistula, the abnormal opening closed after the cause was removed. In the sixty cases mentioned above, stone was the cause in 6; pessaries in 2; confinement had preceded the malady in 28, and 17 of these confinements had been completed by artificial means; and once only did the fistula occur in consequence of a fall upon a pointed object. Most favorable of all will the prognosis be in those cases where the bladder has been wounded by a sharp, non-contusing instrument, as in lithotomy. The chances of spontaneous cure depend on the seat of the fistula, the direction of its long diameter, the tension of its edges, their thickness and vitality, as well as the presence of complications, such as inversion of the vesical mucous membrane.

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[1] Cases of Fabr. Hildanus, Cederschjöld, Guthrie, Sédillott, Féron, Habit, Danyau, Depaul, Monod, Denaux and Gaitskel.

As regards the prognosis of the different kinds of fistulæ, we would expect *a priori* that the lowest, being the most accessible, would be those most easily curable. Such is by no means always the case. Simple urethro-vaginal fistulæ have indeed sometimes been cured both quickly and easily. Pecchioli cured one by cauterization with nitrate of silver in 25 days; Da Costa, Duarte and Hobart did the same with cauterization and a single suture; the author cured 12 with stitching simply. But the injuries to the lower portion of the bladder, in which the urethra takes part, are much worse. For not only is the urethro-vaginal septum much thinner than the vesico-vaginal one, but it is difficult to spare sufficient tissue for the operation, since the thickness of the muscularis and the whole wall diminishes from above downwards, and the danger of incontinence increases as it gets thinner (Simon). On the other hand those fistulæ which are situated below the vesical mouths of the ureters, and the uretero-vaginal fistulæ, were held by many to be of the most unfavorable prognosis. As Simon has shown us, this is not always the case. Those of the first class are all curable, as are also many isolated uretero-vaginal fistulæ.

The most recent collection of statistics as to curability are those of Bouqué. They are as follows: 60 fistulæ of various kinds healed spontaneously; 109 ditto healed by cauterization; 25 out of 34 by immediate secondary union = 71.4%; and 463 out of 639 fistulæ by suturing = 72.0%.

Thus $\frac{1}{10}$ of all cases are incurable in the hands of the most skillful practitioner. Besides this, a large proportion of the patients cured had to undergo several operations. Many operations done by most skillful surgeons fail; as has happened to Jobert, Bozeman, Simon, B. S. Schultz, Baker Brown, Schuppert, Courty, Spiegelberg, de Roubaix, Follin, Andrade, etc. Many fistulæ are at once declared incurable, either on account of the great loss of substance, or because of the destruction of the urethra. Even when the operation has been successful, complete continence has not always been obtained, some patients being unable to retain their water when standing or walking. In addition to this the operation itself may be dangerous, especially when working in the neighborhood of the peritoneum; so that death has occurred in the most skillful hands.[1] So that we must be cautious in giving a favorable prognosis for certain fistulæ; nor must we forget that whether we use cauterization, or the knife, whether we are tyros or practised operators, we may possibly make the patient's condition much worse by increasing the size of the fistula. Thus Bozeman's case No. 2 was one previously operated upon by G. Simon (No. 10); and the lentil-sized fistula which Simon had left was large enough to accommodate a finger easily after Bozeman's operation.

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[1] Simon 4.4 per cent., and single cases by Roux, Wutzer, Herrgott, Jobert, Dieffenbach, Follin, Spiegelberg, Schuppert, Sims, Heppner, Kuchler, Courty, Wilms, and others.

Finally, many fistulæ can only be closed by operations which render the patient sterile for the future, either by using the posterior lip of the cervix to fill the defect caused by the loss of tissue, or by obliterating the vagina transversely. Occasionally after this latter operation, as after marked stenoses of the vagina, a satisfactory cohabitation is no longer possible.

Even after the operation is done the sufferings of the patient are by no means necessarily ended. Calculus formation, cystitis, and pyelitis (case 2 of Simon) may still cause a fatal termination.

The causes of death in non-operative cases are either of a local or of a general nature. Local inflammatory processes, peritonitis, ulceration, general exhaustion, or even tuberculosis, may occur. The cases that died after operation were either cases in which peritonitis followed injury to the peritoneum (Spiegelberg, Simon, Bozeman), or where death was caused by pyelitis or septicæmia following suppurative inflammation of the connective tissue between bladder, uterus, and rectum.

On the other hand weak and emaciated patients sometimes recover so quickly after a successful operation as to be hardly recognizable. The extensibility of the bladder, even when large defects have been present, increases continually. If conception now ensues, pregnancy, delivery and childbed may run a perfectly normal course, if there are no extensive stenoses. This was the case in Simon's cases 6, 23, and 30. I have already mentioned my father's case, in which a new contusion at the same spot in the next delivery cured the fistula. In recent times the successful operations of the German surgeons have risen to 85 to 90 per cent.;[1] the mortality hardly reaching 2 to 3 per cent. It is true that Verneuil lost 5 of the 80 patients he operated upon = 6.2 per cent; but they were done at a time at which antiseptic precautions were hardly used in France.

Treatment of Urinary Fistulæ.—A repeated examination of the fistula will soon show us whether there is any hope of cure by operative procedure, or whether it is incurable, and the symptoms only can be treated. In all recent cases, before thinking of operation, we would endeavor to obtain spontaneous cure by removing all hindrances and obstacles to the process.

Various are the ways that have been proposed to obtain this end. Fabricius Hildanus used frictions of the edges, injections, balsams, and internal remedies. Desault placed a cylindrical pessary in the vagina; Monteggia, Barnes, Marjolin, Sédillot, Herrgott, Habit, Nélaton, Danyau, Follin, Conradi, Gaitskel employed the permanent catheter, either with or without vaginal injections; others tamponed the vagina in addition, so as to prevent the outflow of urine through it, as Cumming, Freund, Burkner, Aubinais, Danyau. Others again introduced a sponge. Elsässer had one patient lie upon her abdomen for nine weeks, without using the catheter, and giving only low diet; he cured her in twelve weeks. Burchard (Breslau) cured four cases of vesico-vaginal fistula by the vaginal tampon alone. Some, like Duparcque and Dupuytren, used mild aperients, secured extreme cleanliness, and saw the fistula heal without further local treatment. In this category belong the cases of spontaneous cure after the extraction of perforating calculi or incrusted pessaries. Reid cured a fistula by plugging it, so that no urine could pass, by means of a bottle-shaped bag of inflateable rubber. Raffaele (Florence) recommended the use in the vagina of an inflated bladder to cause pressure. Tomes de la Villanueva improved his patient, and secured continence of urine for several hours, by making his patient lie continuously on one side; she finally got entirely well. A like case of vesico-uterine fistula is related by Habit. Zechmeister had a patient who could only endure the catheter for forty-eight hours; so he had it used every half hour while walking and standing, and every 2 to 3 hours while lying down.

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[1] Simon, Hegar, B. S. Schultze and Spiegelberg.

Reybaud (Lyons) closed the fistula with an obturator, introduced a sponge into the vagina, and fixed the whole with a T-bandage.

Féron (Paris) used a pig's bladder for a considerable time as a colpeurynter, and then a rubber pessary. The patient recovered, and had a child one year later without further injury.

Maruéjouls cured a case by using a Gariel pessary, and was able to discontinue it after a few months.

Conradi cured a patient by using a golden button, the head being in the bladder, the neck in the fistula, and the plate in the vagina; in five years it fell out, and the patient was cured. Verneuil, Schup, F. Winckel, Depaul, Hildebrandt, Monod, Freund, and others saw the spontaneous healing of fistulæ without any local or general treatment at all. Not only small, but very considerable fistulæ have closed in this way (Guthrie, Marjolin, Hildebrandt), and we should always first endeavor to obtain it. Thus Palfrey, who formerly operated as soon as possible, now holds that by procrastinating many patients can be spared the necessity of undergoing any operation at all. Two indications are to be fulfilled, to effect a ready outflow through the urethra, and to prevent an outflow through the vagina. The former indication is met by placing a metallic or elastic catheter in the bladder. Thus Fritsch (J. D. Von Heyne) passes a drainage tube 4 inches long and ⅛ inch in diameter through the urethra in the bladder, and washes the viscus out through it. Every two days the tube is removed and cleaned. The carbolic injections also exercise a mild cauterizing effect upon the edges of the fistula. Two cases were cured in this way. If the catheter or drainage tube is not well borne, we must catheterize every 1 to 3 hours. The second indication is to be met by a careful tamponade of the vagina. The best material to use for this purpose is the ball of salicylated cotton covered with linen, which Esmarch has introduced into practice; for small portions of loose charpie and cotton can easily pass through the fistula into the bladder, and there form the nucleus for the formation of stone. The colpeurynter and sponges are not sufficiently antiseptic, nor do they fit well enough. If the amount that passes through the vagina is small, the tampon may remain *in situ* for several days; in other cases it must be renewed daily after evacuating the bladder with the catheter.

The healing of the fistula may be favored by placing the patient in an appropriate position, either lying on the side opposite to the fistula, or lying upon the abdomen. (See Winn.)

There are authorities who are opposed to the above method, and who claim that the catheter is not well borne by an irritable bladder, and that vesical spasm, abdominal pain, vomiting, and other symptoms are caused by it. Among them are Velpeau, West, Baker Brown and others. This is sometimes the case; and then we can only pass the catheter every few hours, or perhaps not at all. The tampon will cause no trouble, and it may be tried both in recent and in old cases. So long as the patient improves it is to be continued, for months if necessary.

If the fistula becomes no smaller, and the patient is no better, is operative interference indicated? and if so, of what nature should it be?

The answer to the first part of this question depends upon the size, seat, nature, and complications of the fistula. It depends also upon the experience of the surgeon; Simon has cured many a fistula which other surgeons have failed to remedy. For it is undeniable that as in recent times the operation by freshening the edges and suturing is more and more frequently and successfully done, the more the other methods are neglected and cast aside. To Ed. F. Bouqué belongs the credit of having reintroduced among others the method of cauterization either alone or together with immediate union of the edges; for he rightly says that: "Les fistules vésico-vaginales dans leur grande variété ne répondent pas à une seule indication, à un seul de moyens thérapeutiques connus; mais que tous sont appelés à rendre, dans un certain nombre de cas, des services à l'exclusion des autres et que tous par conséquent méritent d'être étudiés à un égal degré."

Let us now consider cauterization as a means for the cure of urinary fistulæ. Its object is to cause the formation of a more or less deep eschar at the edges of the wound, or in its neighborhood, and to close the orifice by the granulation and cicatrization which occur when the slough is cast off. Various caustics may be used; the red-hot iron, the galvano-cautery, nitrate of silver, acid nitrate of mercury (Ehrmann, Cousot), creosote (Emmert), sulphuric acid (Soupart, Du Moulin, van Wetter, Deneffe, de Lorge and others), chromic acid (Deneffe), the juice of euphorbia (Soupart), caustic potash (Deneffe, van Wetter), chlorine water, Vienna paste and others. They may be applied either from the vagina to the genital mucous membrane in the neighborhood of the fistula, or from the vesical surface, or finally to the fistulous tract itself.

Cauterization of the neighborhood of the fistula from the vagina was first practised by Chelius in 1844. He cauterized with nitrate of silver in substance a broad tract of the vaginal mucous membrane around the fistula, and about half an inch from its edges. The method was especially favored by Soupart, Du Moulin, van Wetter and Deneffe in Belgium; and Soupart modified it by converting the simple perifistular cauterization into a perifistular centripital cauterization, making each successive application nearer and nearer to the fistula, yet without touching its edges. He used sulphuric acid as well as the actual cautery and the galvano-cautery. A second cauterization is undertaken as soon as the eschar caused by the one is cast off and the wound is cicatrized.

An older method was the so-called intermediary or intra-fistular one of Desault, which consisted of cauterizing the inner surface of the fistulous canal. The actual cautery, and lunar-caustic in holders from which it could be projected, were especially used. Dupuytren, Lallemand, G. Simon, Soupart, and others have cured cases in this way. Sometimes the vesical mucous membrane near the fistulous opening was cauterized at the same time. Dupuytren and Velpeau described instruments carrying a piece of lunar caustic bent to a right angle, which could be projected and used to cauterize the vesical mucous membrane for a certain distance from the orifice.

This procedure has been improved upon by Soupart, Deneffe and Bouqué, so that an intra-vesical cauterization may be conducted as follows: in a hollow sound shaped like a uterine sound, but thicker, is a mandril, to which a small sponge soaked in chromic acid or a piece of lunar caustic may be attached. The fistula is then fixed by the left index finger in the vagina, and the bladder being empty the sound is passed to the neighborhood of the fistula through the urethra, the caustic holder projected, and with the help of the finger in the vagina, is swept over a vesical surface surrounding the fistula and some ½ inch distant from it. The cauterizations per vaginam and per vesicam are not always concentric, and the uneven cicatrization leads to a more rapid reduction of the size of the fistula.

These three methods of cauterization may be used singly or combined, on urethro-vaginal, vesico-vaginal, and vesico-uterine fistulæ; it is applicable not only to small fistulæ, but to those also which measure 2 to 3 inches in diameter (Nélaton, Passamonti).

It may be urged as an objection to the cauterization method that the cicatrices it causes in the neighborhood of the fistula diminish the chances of a subsequent cutting operation; but this has not been found to be the case. It must be conceded, however, that severe intra-fistular cauterization may occasionally cause enlargement of the fistula.

Cauterization has been recommended for a number of fistulæ in which a bloody operation is contra-indicated; namely those situated high up in the anterior vaginal vault, and those in which the peritoneum is liable to be wounded, though peritonitis from the latter cause is hardly to be feared now that we use systematic antiseptic precautions. It has also been recommended for vesico-uterine fistulæ, so as to prevent union of the lips of the os and sterility, though the process itself is liable to cause atresia. It was not to be thought of for uretero-uterine and uretero-vaginal fistulæ, on account of the danger of closing the ureter, with subsequent uræmia.

As to the most suitable time and method for cauterization, there is considerable difference of opinion. Some authorities, as Nélaton, Verneuil, Trélat, West, Sims, Schuppert, would wait six to twelve months, to give time for as great as possible amount of cicatrization of the original wound; others, like Velthem, Baker Brown, and especially Nottingham, with Bozeman, Wright, Warner, etc., recommend cauterization as soon as possible. Nottingham relates that he found only small fistulæ in a woman 3 months after confinement; but that 3 months later, probably in consequence of coitus, they were 3 times larger than before. The length of time required for cure by this method is in favor of early cauterization; according to Bouqué, when done less than 1 month after the injury it was 41.1 days; 1 to 2 months after, 75.6 days; later than 2 months, 115.8 days, and the average. The average time for all cases cured by cauterization was 77.5 days.

There is also no agreement of opinion concerning the length of time that should intervene between single cauterizations. If we wait for complete cicatrization we may have to wait for months, though my experience confirms the opinions of Soupart and Bouqué in that two to three weeks is usually enough. Only very considerable losses of substance and ureteral fistulæ contra-indicate cauterization. It may be employed in pregnant women; sulphuric acid has been freely used in such cases by Deneffe and Bouqué without doing any harm to the patient.

Cauterization has the advantage of not requiring any special preparation of the patient; though the same remark applies to Simon's operation. Any position may be employed, and the fistula must of course be as thoroughly exposed as for any other operation.

After-treatment is very unimportant. As a rule, narcosis is not necessary. After using neutralizing or refrigerating applications to prevent any possible injurious effect of the caustic upon neighboring organs, the patient can get up and go about her usual business. It is unnecessary to use the catheter at all. The believers in cauterization declare tamponade of the vagina to be useless and harmful. If there is pain after the operations, sponges and cloths wrung out in cold or ice-water may be introduced into the vagina; or lukewarm sitz-baths, with injections of belladonna and opium, may be employed.

In this connection we may mention a method first proposed by Naegele V. in 1812, and which consists of union of the edges of the wound by forceps, serrefines or even stitches, after cauterization. While the first instruments used were voluminous and heavy, those of Tellinucci, Monteros, Deneffe and van Wetter are not heavier than those used by Bozeman, Simpson, Atlee, Battey, and others. It is of course necessary that the edges of the fistula can be drawn together without any too great tension; and granulation along the edges of the cut must be active beforehand. Bouqué, who believes that this procedure deserves far more attention than it has hitherto received, says: the larger the freshened surfaces, the greater the chances of healing. He found 35 published cases which had been treated in this way, 25 were cured, 4 improved, and 3 died. Bouqué's list of 639 operations with the knife[1] give a percentage of successes of 72 per cent.; the above 25 cases give a percentage of successes of 74.4 per cent.; and he believes it may compare favorably with the more common mode of operation. I confess that I have been led to form an exactly opposite conclusion; I believe it takes longer time, gives much more pain and trouble, and has results which are not so good.

Altogether I must remark that in spite of the many successful results of the method of cauterization, the ideas of the Belgian authors whom Bouqué represents are opposed to those of the German school. Bouqué says: For most practitioners the immediate union of the fistula will recommend itself on account of its simplicity and ease of execution, and many other advantages; and there is no reason why we should not first try the value of the various cauterizing agents in any given case. But these attempts should be methodical, and should be persevered in for a sufficiently long time. We need not have recourse to a bloody operation until we have sufficiently proven the uselessness of caustics. The German authorities on the other hand believe that the cauterization of large fistulæ is entirely useless; that severe cauterizations, especially by the actual cautery, often do direct damage, enlarging the fistula and transforming its walls for a considerable distance into hard, unyielding cicatricial tissue; further, that a successful result from cauterization can only be expected under certain well-defined conditions, those conditions being that the fistula is small and has broad, granulating edges, as recent fistulæ in the puerperal period, or small fistulæ left after other operations. If cauterization is not rapidly successful, it is soon abandoned in Germany, since by persevering in it we only spoil our chances of a future operation. (Hegar, l. c. p. 351.) That they are not rapid is shown us by the above statistics; while hundreds of fistulæ have been entirely cured in a few days by a bloody operation in the hands of skilled, and even unskilled surgeons.

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[1] Cases of Jobert de Lamballe, Follin, Bozeman, Monteros, de Roubaix, Baker Brown, Simon, Schuppert and Courty.

Indeed Professor D. G. Boddaert van Cutsem of Ghent has personally assured me that he, as well as the majority of the Belgian surgeons, decidedly favor operative union, and only exceptionally employ cauterization. Since cauterization by no means always cures these fistulæ, the very earliest authors have sought to devise measures to secure a direct artificial union. Roonhuysen proposed in 1663 freshening of the edges with subsequent continuous suture. Fatio, a Switzer, is said to have cured the first case by suture in 1752. It was then forgotten until Naegelé in 1812 again recommended it. At once many various stitches were proposed by Naegelé, Roux, Wutzer, Schreger, Ehrmann, Blasius, Colombat, Beaumont, Dieffenbach, Esmarch. They did no particular good, partly because the fistulæ were imperfectly exposed, and partly because the freshening of the edges consisted either of a superficial scarification, or the removal of a band a line in width.

Nor could better results be obtained by changing the materials used for suturing. Gilded, silver, steel, straight or curved needles, insect needles, or the use of silk, golden, iron or silver threads were of no avail. Three men have done more than all the others combined for the operative cure of urinary fistulæ; these are Jobert de Lamballe in France, 1834, Gustav Simon of Darmstadt, and Marion Sims of New York.

In 1853 Simon showed that the gist of the operation lay in an exact freshening and a careful suturing. He simplified the operation, and deserves credit for taking it out of the hands of a few specialists, and placing it in those of a large number of surgeons and gynecologists.

The operation may be done at all ages and at any time. G. Simon did it in 1866 in a girl eight years old. (Case No. 9.) It has been done after sixty. It has been performed successfully during menstruation, and during pregnancy, though premature delivery has been seen to occur in consequence. (Schwartz.) Excepting carcinoma of the uterus or vagina, the only contra-indication is such excessive weakness as to render speedy death probable, as in a case suffering from a rapidly progressing cheesy pneumonia. In such cases no operation should be undertaken, since the pain, loss of blood, uncomfortable position, and the use of chloroform, might cause the patient to die upon the table.

The best time for operation was formerly the subject of much discussion. Nélaton, Verneuil, Sims and West placed it at 6 to 9 months, Kiwisch, Baker Brown, Bozeman, Simon and Hegar at a few weeks after the occurrence of the fistula. Recent statistics show us that it is not wise to postpone the operation more than 6 to 8 weeks after delivery. I have repeatedly cured large fistulæ by freshening and suture, during the first 6 weeks *post-partum;* and Hegar always obtained a good result by a first operation done 6 to 8 weeks after birth. Hegar rightly claims that the treatment of other co-existent maladies is much simplified by the operation. Most patients themselves desire to have it done as soon as possible. Even if the edges of the wound are not yet entirely cicatrized, they can be thoroughly freshened; and besides, being unthinned and unfixed by cicatricial tissue, they are more succulent and vascular than they will be later. Gravidity is not in itself a contra-indication. Pregnant women stand the operation well, and quickly recuperate when the continence of the bladder is re-established, as the cases of Cohnstein, Rogowicz, and Schlesinger prove. Kroner, however, cites 5 cases, in 4 of which premature delivery took place after the fistula operation. In the case of fistulæ caused by calculi and pessaries, the croupous cystitis and colpitis must first be cured and the wound become clean, before any operation can be attempted.

The exact time of operation will depend upon whether any preparation for the operation is necessary. In most cases it is not; especially if there are no extensive cicatrices, and no vaginal and vulvar ulcerations. And even if such measures should be necessary, it is better to combine them with the operation, rather than to draw them out for days beforehand, as some surgeons do. Thus Bozeman gradually dilates cicatricial bands by cutting, and subsequently by using rubber tampons. Thus the pus and urine was directly applied to the cuts, and colpitis, cystitis, and if the pelvic connective tissue be opened, abscesses may occur, as also parametritis and pelveo-peritonitis, endangering the patient's life. This occurred twice to Simon and Bozeman. (Cases 3 and 4.) Simon himself admits that incision is difficult and requires considerable experience. Very recently Bandl, von Massari, and Pawlik have obtained very good results by Bozeman's method of preparatory treatment, in sufficiently operable fistulæ. The vulva and vagina are first cleansed of urine by means of sitz-baths and lavements of hot water, and the sore spots are brushed over with a 10 per cent. solution of nitrate of silver. The incised cicatricial bands are also brushed over in the same way, and the dilating instruments introduced. In this manner Bandl, Massari, and Pawlik have always thus far been able to avoid kolpokleisis.

As a rule, vaginal injections, a warm bath, as much nourishment as possible, and repeated and exact examinations of the patient, are all the preparatory treatment that is necessary. Repeated examinations are necessary to determine the size, seat, and complications of the fistula, to determine in which position the fistula can be best exposed, and to decide beforehand upon the method of operating.

Now as to the patient's position. Dieffenbach, Jobert, Baker Brown and others prefer the simple dorsal or lithotomy position. Deep fistulæ can be well exposed in it, anæsthetization is easy and rapid. But fistulæ seated high up cannot be well-exposed from the inclination of the pelvis. Simon has, therefore, introduced the dorsal position with the pelvis so elevated that it lies somewhat above the level of the abdomen and chest. The thighs are flexed upon the abdomen, and the legs are extended. Thus the field of operation is free, assistance can be rendered with certainty, the use of several specula and retractors at the same time, is possible, and narcosis is well applied. Nevertheless the patient's position, even when the head is supported by a cushion, is unpleasant and tiresome, and some patients feel sick for days after being in it.

The lateral position is much more convenient for the patient, and the side corresponding to the fistula should be selected. Less assistants are needed, it is unconstrained, anæsthetization can be easily affected, and the height of the buttocks can be varied for higher or lower fistulæ. For those unused to it, the exposure of the fistulæ and the use of instruments will present some difficulty in this position. Sims is its chief advocate.

His pupil, N. Bozeman, has, however, selected the knee-elbow position, which Schreger, Wutzer, and Simpson had already employed. Bozeman uses a special speculum (see Fig. 28) consisting of two lateral blades united by a metallic bar, which bears the screw; when dilated to a certain extent, the blade for the posterior vaginal wall can be inserted. Simon was convinced, by seeing one of Bozeman's operations, that with his position and speculum the fistula can be admirably exposed, and the result of every cut and every stitch can be seen during the entire operation. But he believes that it is very difficult to handle the instruments, since Bozeman used the scissors in fistula which were easily exposable and took off considerable tissue, while Simon for various reasons prefers the knife, and spares the substance of the septum as much as he can. However that may be, the accompanying illustration from Neugebauer (Fig. 29) plainly shows that the knee-elbow position is the least convenient of all for the patient, is the worst for anæsthetization, is the most complicated in the apparatus it requires, and is the most annoying for the operator, since the legs are here more in the way than in any other position. These are serious objections; and since Bozeman in the competitive operations attained no better result than did Simon with his position, Simon's or Sims's positions are always to be preferred.

After the patient has been placed in one or other of these positions, she must be held in it by the assistants. Since patients often make vigorous movements while narcotized, I have repeatedly tried by means of broad padded leather pelvic girdles, to fasten the patient's pelvis to the table, and prevent motion. But the girdle always pressed upon the abdomen between the anterior superior iliac spines, and several unpleasant cases of asphyxia while under chloroform occurred; so that I had to give up the use of the girdle.

Narcosis is not always necessary. After the patient has been placed in the proper position, we may proceed to expose the fistula. Jobert and Simon drag down the uterus, while Bozeman and Sims do not displace the fistula, but operate *in situ*. All operators first lift up the posterior vaginal wall with a blade or plate, and then draw asunder the two sides with retractors. (Fig. 31, *a*, *b*, *c*.) If the patient is in Simon's or the lateral position, and the anterior vaginal wall falls down under the fistula, it must be elevated with one of Simon's vaginal retractors, or it may be lifted with a sharp hook. If the upper edge of the fistula is high up near the uterus, it may be made more accessible by drawing down the os with a hook, or by passing a couple of strong silk threads though it, knotting them, and giving them to an assistant to hold. If the uterus is fixed by cicatricial bands, or if a precedent inflammation renders the existence of adhesions probable, the uterus is not to be dragged down. If the loss of tissue is not great, and the vesico-vaginal wall is movable, displacement

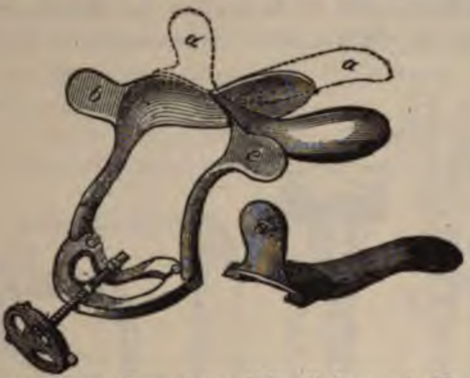


FIG. 28.—SPECULUM FOR FISTULA OPERATIONS. (After *N. Bozeman*). The plate *a* is introduced between the two side plates *b* and *c*.

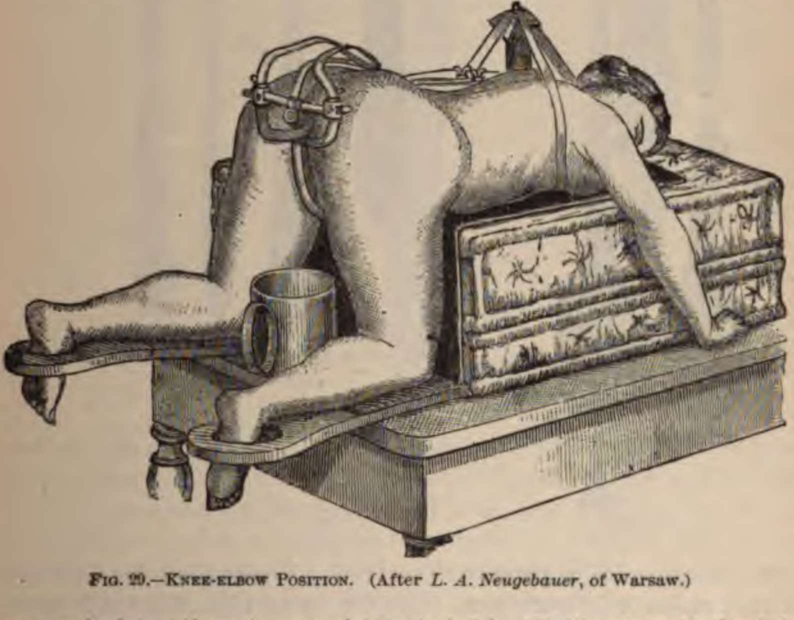


FIG. 29.—KNEE-ELBOW POSITION. (After *L. A. Neugebauer*, of Warsaw.)

of the uterus is entirely unncessary. It is of especial importance to exactly explore and expose every edge and corner of the fistula; for it has happened to the most practised operators, as to Simon in No. 4 of the competitive operations, not to fully close the fistula, but to forget to freshen and unite the edges of some hidden corner. Various means have been recommended to prevent such errors. Chassaignac has constructed an instrument to be introduced from the vagina (Fig. 30), which contains six hooklets to be projected by a piston, and, the hooks catching the edges of the fistula, to stretch it apart. Similar to this, but not so good, is the instrument that Roser has described (Fig. 32.) Antal (Budapest) uses a rubber ball to evert the edges of the fistula and render them tense. It

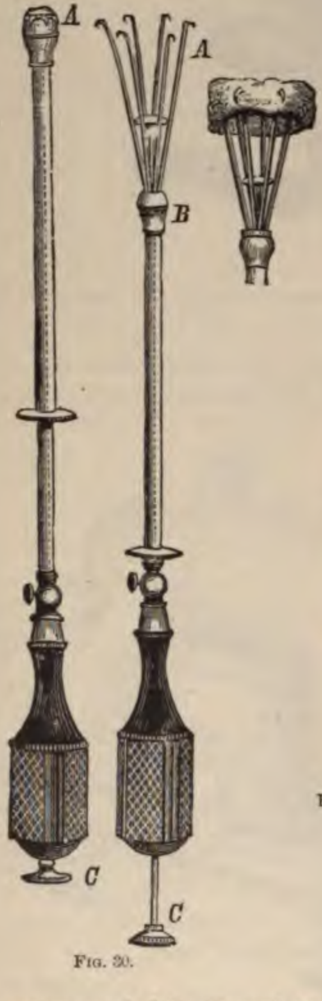


Fig. 30.

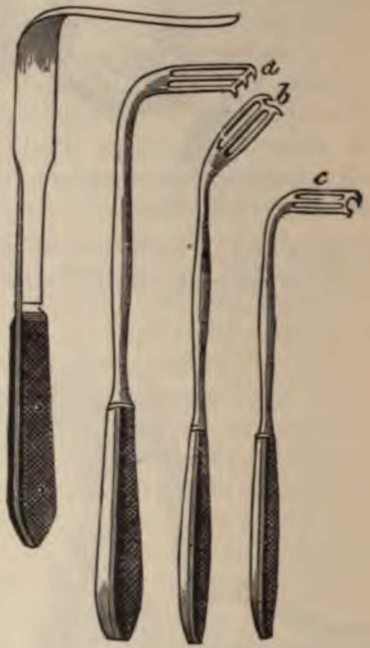


Fig. 31.—G. Simon's Retractors, without a with 2 to 3 Points.

can be dilated to various sizes, is introduced closed into the fistula, and blown up through a rubber tube fastened with a stop-cock. To cut off the edges of the fistula we must accurately grasp each portion; for this purpose long-hooked forceps, like that of Simon and Matthieu (Fig. 33, *a* and *b*), or that of Simon and Roser (Fig. 34, *a* and *b*), or single or double hooks (Fig. 34, *c*) are all that is necessary. They are to be preferred to more complicated apparatus.

Probably for the same reasons the various complicated speculæ introduced with the object of diminishing the number of assistants, have not found general acceptance. Marion Sims's instrument is shown in Fig. 36; the American and that of Spencer Wells in Figs. 37 and 38; and the complicated apparatuses of Neugebauer, Ulrich, and Bozeman in Fig. 35. For we cannot vary the tension and position of the fistula with them as minutely as may be necessary during the operation. If cicatricial bands prevent the full stretching of the fistula, they must be incised, or divided.

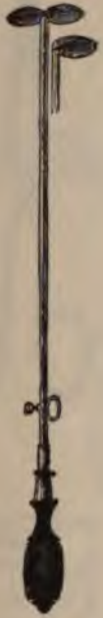


FIG. 32.

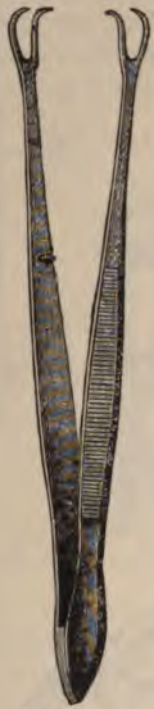


FIG. 33 *a*.

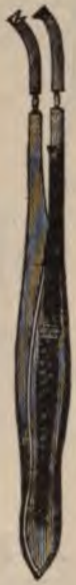


FIG. 33 *b*.

The edges of the fistula being fully exposed, we now proceed to freshen them up. Different instruments are used by various surgeons for this purpose. G. Simon and Sims employ only long-handled straight or elbow-bladed knives, with blunt or sharp points; while Bozeman only

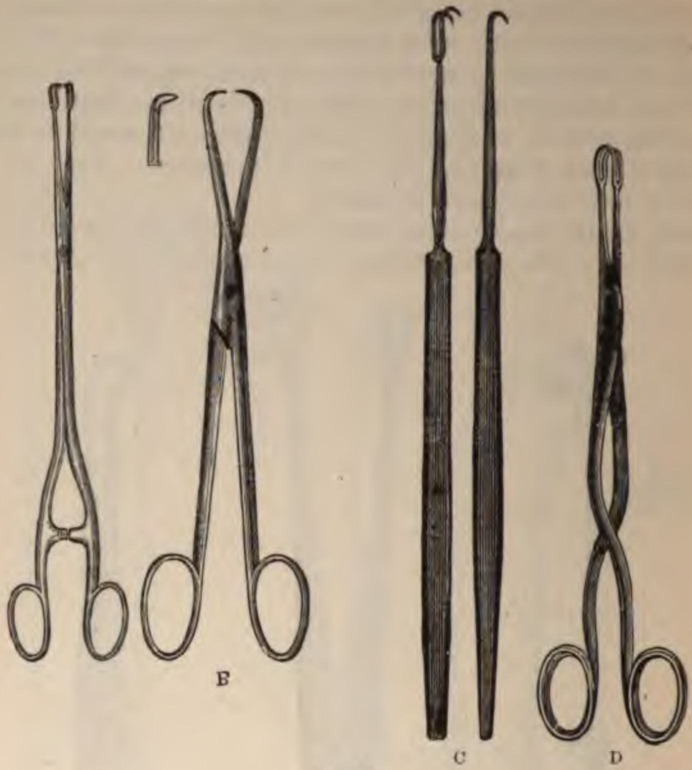


Fig. 34.

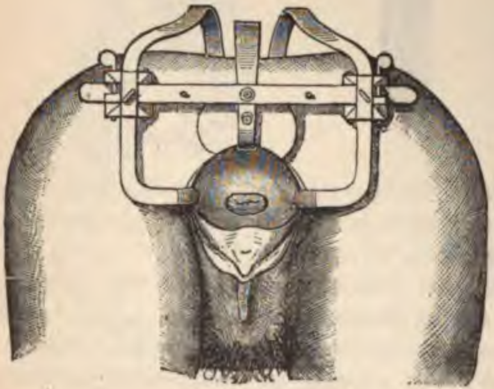


Fig. 35.

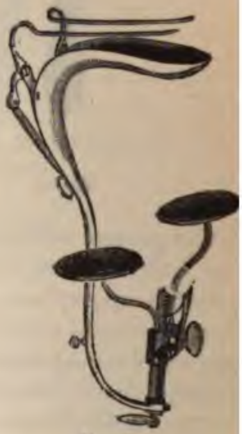
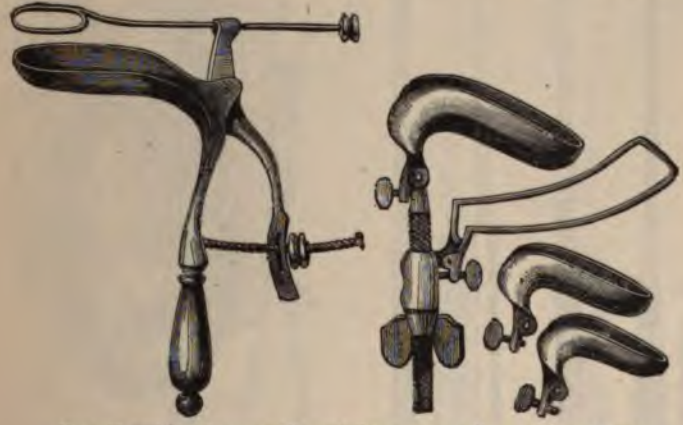


Fig. 36.

Fig. 35.—Three-bladed Dilator of Neugebauer. Applied in the knee-elbow position for a fistula-operation.

Fig. 36.—Marion Sims's Fistula Speculum.

transfixes the edges of the fistula with his knife, and completes the ablation of the edges with the scissors. Simon made the objection to the scissors that it was liable to contuse the tissues and cause considerable loss of substance, and that in vesico-vaginal fistulæ situated near the urethra it might easily endanger continence, although he admitted that the operation could more easily be done with the scissors than with the knife in the deeper cavities. But he says that when we come to the successive ablation of the edges, to be continued until we reach perfectly healthy tissue, the knife is far preferable to the scissors for the preservation of tissue. We endeavor, of course, to obtain broad, smooth, vascular edges, free from cicatricial tissue; it has therefore been disputed whether it is preferable to freshen along the surface of the vagina, and spare the vesical mucous membrane as much as possible (the American method), or to freshen perpendicularly from vagina to bladder (G. Simon). The former method will probably enable us to avoid vesical hemorrhages with greater certainty. Hegar employs the flat funnel-shaped freshening when the edges still contain cicatricial tissue, claiming rather inconsequently that he thus sacrifices less tissue than he would if he freshened perpendicularly outside the area of scar-tissue.



FIGS. 37 and 38.—SPENCER WELLS'S SPECULÆ FOR FISTULA OPERATIONS.

It is necessary before incising to mark out with the point of the scalpel the line of incision upon the vaginal mucous membrane; thus enabling us to keep at an even distance from the borders of the fistula. In doing this we must take into consideration the best direction to cut, so as to secure coaptation of the edges. The invaginated vesical mucous membrane which projects through the fistula must be replaced and held back before the cutting begins. This may be done by a sponge attached to a thread and passed into the bladder, or by an assistant holding back the tissue by means of a sponge attached to a sponge-holder. But the introduction of a good-sized catheter into the bladder will suffice to crowd the fistula from the vesical side against the instruments of the operator, and thus make the requisite tension. It will do so best, of course, with small fistulæ.

The lowest edge of the fistula is now transfixed about half an inch from the orifice, and the freshening of the edges is proceeded with evenly

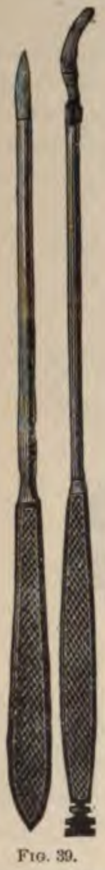


FIG. 39.

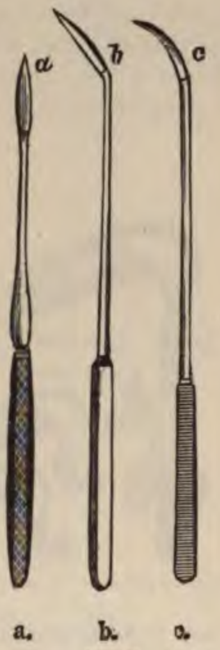


FIG. 40.

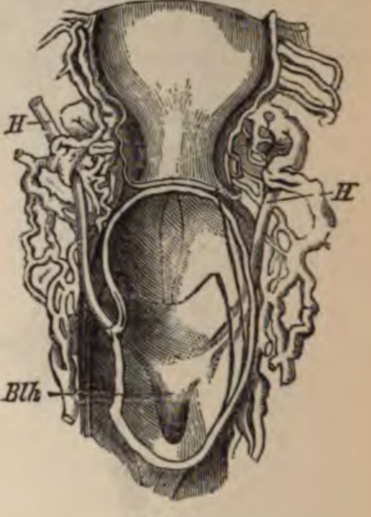


FIG. 41.

FIG. 40.—HEGAR'S FISTULA-KNIVES. (Fig. 138 in Hegar-Kaltenbach.)
FIG. 41.—POSITION OF THE UTERUS. *H H*, Near the uterus. *Blh*, Vesical neck. (After *Luschka*.)

along the line marked out. Meanwhile the assistants carefully sponge and irrigate the wound with a 3 to 5 per cent. carbolic acid solution. Spurting arteries must either be seized with an artery forceps, or twisted, or tied. There is most danger from the large arteria vesico-uterina, which runs along the side of the cervix uteri, and is sometimes as thick as a crow-quill. If it were cut, the threads of the ligature might be passed out through the wound, Simon having proven that this does not necessarily disturb healing by first intention. The smaller arteries which may be cut will be included in the subsequent stitches.

There is no doubt that the ureter may be cut through whilst freshening the edges of such a fistula, especially if it be large and is laterally placed. It may be recognized by noticing the urine flow from a small orifice, into which a sound can easily be passed for a considerable distance upwards and backwards. We must then endeavor to bring the cut end into the bladder. It is to be fixed in the edges of the wound, slit up for a certain distance towards the bladder, and then a broad, flat surface freshened for it to unite to. The openings of the ureters in the bladder according to Simon[1] correspond to a point in the vagina about $\frac{2}{5}$ of an inch outside the outer edge of the os uteri, and about $\frac{1}{10}$ of an inch in front of it. Simon has operated upon quite a series of cases where the fistula was at this place or extended to it; but he never observed a symptom which he could with certainty refer to closure of the ureter. In all these cases the ureter was either not included, or if it was the thread cut through the ureter so quickly that no marked interference with the flow

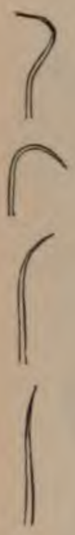


FIG. 42.

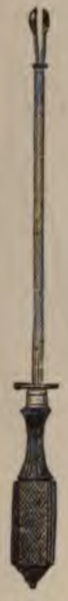


FIG. 43.

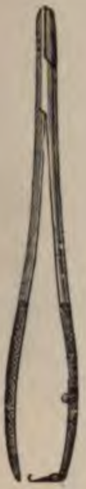


FIG. 44.

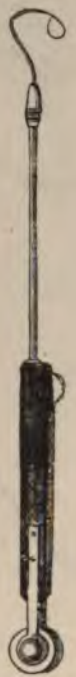


FIG. 45.

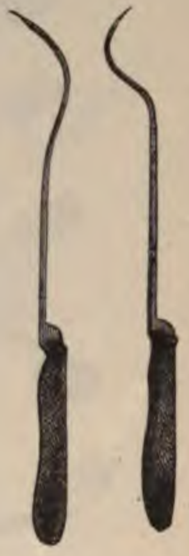


FIG. 46.

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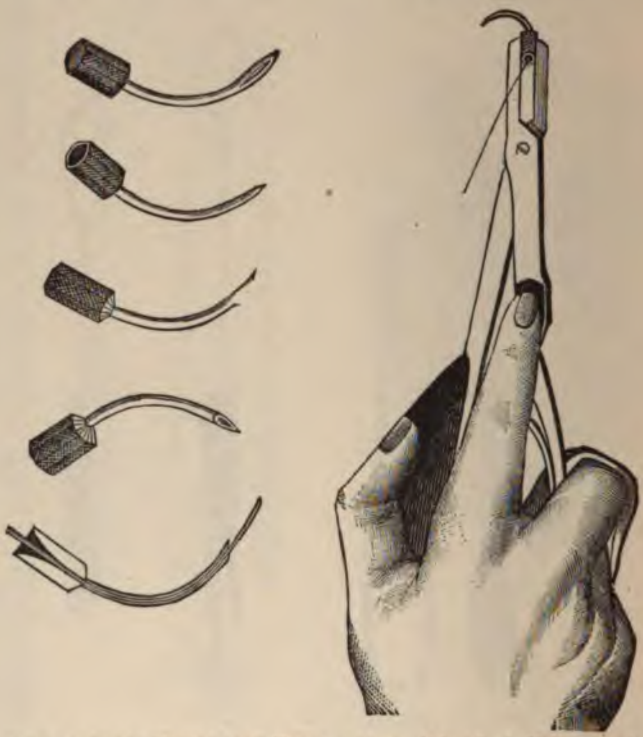
[1] Compare Luschka, Fig. 41, and M. Hall. Contribution to the topography of the female ureter, Wiener Med. Wochenschr, XXXII. 45, 46, 1882.

of urine ensued. If the ureter is seen to project into the fistula, it can be pushed away into the bladder. Pawlik in every fistula operation introduces an elastic catheter through the urethra into each ureter, only removing them after the operation is finished. If this precaution, however, has not been taken, and if after the operation there occur symptoms of interference with the flow of urine, colicky pains originating in the kidneys and radiating along the course of the ureters, with vomiting, etc., the sutures must be at once removed. Finally, before putting in the stitches we must be certain that the bleeding surface is everywhere smooth and clean; all projections, etc., may be snipped off with the scissors.



FIGS 47 and 48.—NEEDLES AND NEEDLEHOLDER. (After *L. A. Neugebauer.*)

The edges of the fistula being now fully prepared, we must decide upon the material to be used for the sutures. Each surgeon naturally advocates the kind he uses himself; Simon likes Chinese silk, whilst Sims, with Bozeman and Hegar, prefers silver wire. I have used silk, silver wire, and iron wire, and in one case where there was but very little tension upon the elongated fistula, even catgut, and have had successful results. Simon objects to wire because he says it is very liable to become the nucleus of a calcareous deposit. But this happens just as often with silk, (see Simon's 17th case,) and silk cannot remain as long in situ as can the wire. When there is much tension, when the loss of tissue is great, when the stitches have to remain in 8 or 10 or more days, silver wire or iron wire is decidedly preferable. Only recently I removed some iron wire from the vesico-vaginal septum which had lain there for 10 weeks without causing a trace of local irritation. Silkworm gut or Fil de Florence is a very excellent material, and I have used it almost exclusively in fistula operations for the last 7 or 8 years. The best plan is to use the materials most suitable for each case, and sometimes to use more than one kind at an operation. Pippingskjëld uses alternate iron and copper or iron and silver threads at distances of $\frac{2}{5}$ of an inch, and claims by this galvanic suture to have obtained union when he could not have done it in the ordinary way.

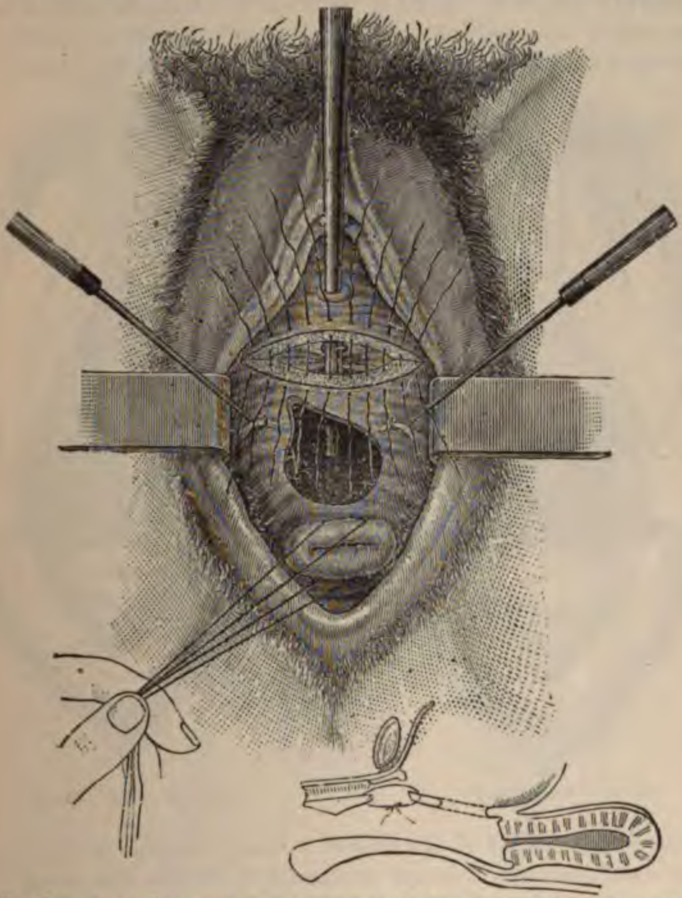


FIG. 49.—METHOD OF OPERATING WHEN THERE IS ATRESIA OF THE URETHRA BETWEEN TWO FISTULÆ. (After *Simon*.)

The needles (Fig. 42), are either curved ones of various sizes used with a Simon (Fig. 43) or Rose (Fig. 44) needleholder, or they are long and hollow like those of Simpson (Fig. 45) or Salter (Fig. 46) or Neugebauer (Figs. 47 and 48); Hagedorn's needleholder may also be used. It was formerly the custom to put the stitches at different distances from the margins of the wound; and Simon and Küchler used the so-called double suture, the more distant (½ inch) threads being designated tension, and the nearer ones uniting sutures. Latterly Simon himself gave up these tension-sutures (compare Fig. 49) and passes all his sutures one or two lines from the edge of the wound. When the edge of the freshened surface is considerable it is not necessary to transfix the vesical mucus membrane; Simon usually did so, but not always (comp. Fig. 49), whilst Sims and others avoid it. About 1½ lines should be left between adjacent sutures. But before the surfaces are united the entire surface of the wound must be wiped, and washed with cold water to remove coagula and other foreign bodies from between the surfaces to be united. When the stitches are tied, union may occur transversely, or longitudinally or obliquely. The first is the best, causing the least tension. Simon rightly always united the edges in the direction of the longest diameter of the fistula. Triangular fistulæ, whose base is at the urethra whilst their apex

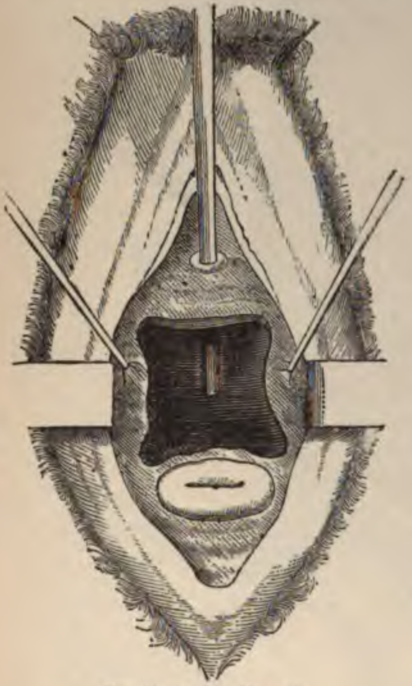


FIG. 50.—(After *Hegar*.)

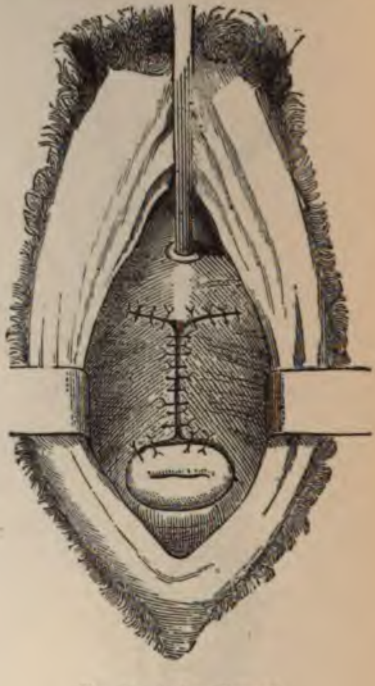


FIG. 51.—(After *Hegar*.)

is at the os uteri, and large square openings he even closed thus ⊤ and thus ⊼, and cured them. He regards it as a disadvantage of Bozeman's method that from the lateral tension upon the vagina the fistula had always to be united transversely. (Comp. Figs. 49, 50, 51.)

In deep-seated fistulæ, and such as cannot easily be dragged down, it is not easy to tie the knot of a silken suture, and the thread is very liable to break in the operation. This cannot occur with wire. Bozeman lays a leaden plate upon the wound before twisting the sutures, and presses this plate against its edges by the wires. He then passes the wire through split shot. The whole proceeding is too complicated to find general acceptance, nor does it ensure any better results than a simple knot in silk sutures, or twisting wire sutures directly over the wound. Bozeman uses very thick wire, and places his sutures ⅜ of an inch apart.

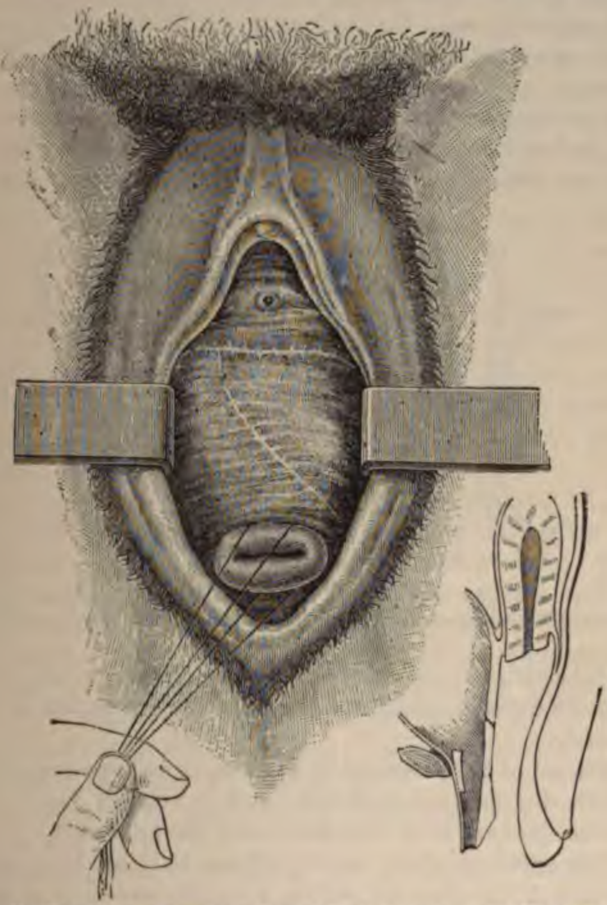


FIG. 52.—THE SCARS OF THE TWO FISTULÆ WITH ATRESIA OF THE URETHRA.

After all the sutures are tied, and their ends cut off short, the bladder should be emptied with the catheter and washed out with a weak solution of salicylic acid. This enables us to decide if our union is perfect, or if any fluid still exudes. A neglect of this precaution has necessitated Simon himself repeating the operation more than once.

The after-treatment has been greatly simplified by Simon. The patients are allowed to urinate at will, and can get up at once if they feel strong enough to do so. On the fourth or fifth day, if silk sutures have been used, otherwise later, the stitches are to be removed. The catheter is only employed when the patients cannot micturate spontaneously. Bozeman on the other hand leaves an elastic catheter permanently in the bladder, washes it out several times daily, and gives large doses of opium. My own experience is decidedly in favor of Simon's simpler plan.

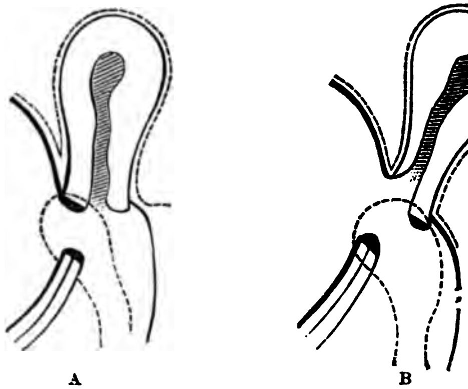

A B

FIG. 53 A and B.—SUPERFICIAL AND DEEP VESICO-UTERO-VAGINAL FISTULÆ. (After *Hegar*.)

Vaginal injections are only necessary if there is any foul-smelling secretion. Easily digestible food and regular daily evacuation of the bowels are necessary.

The removal of the sutures is to be done, as we have said, on the fourth to the sixth day in the case of silk, after the eighth day in the case of wire. Sore spots are to be cauterized with the solid stick.

Any little openings which may be left can be closed by means of caustic applications; if this does not suffice, it will be necessary to operate again in 2 to 4 weeks time.

This is the mode of procedure in urethro-vaginal and vesico-vaginal fistula. Some special additional precautions are, however, necessary for vesico-uterine and uretero-vaginal fistulæ.

In the superficial vesico-utero-vaginal fistulæ the anterior lip of the os uteri is freshened and is united to the lower edge of the fistula, which is formed by the vesical or possibly the urethro-vaginal wall (Fig. 58 *a*); whilst in the deep vesico-utero-vaginal the posterior lip of the os is to be united in the wound, thus making the woman sterile (Fig. 53 *b*). Recently, however, Hegar has several times succeeded in curing longitudinal fistula with the help of very small remains of the anterior cervical wall.

As A. Martin and K. Schröder remark, vesico-uterine fistulæ show a great tendency to spontaneous cure, though operative interference may be necessary when they have existed for a long time.

In vesico-uterine fistulæ, when we cannot, after dilating the cervix, close the vesical opening by energetic cauterization (see successful cases of Hildebrandt and of Kaltenbach), we must split the cervix bilaterally, and bring the fistula into eyesight by dragging down the anterior lip of the womb. The edges of the fistula are then to be excised, and the cut surfaces united by suture. R. Wilms has told me himself that he did this operation successfully long ago a number of times. A. Martin, Lossen, Müller (Oldenburg) and many others, have done it; and I have cured five of my patients in this manner, (see below). In two of my cases closure was not complete immediately after removing the sutures;—but it soon ensued. In my first case I used silk, and I was unable to remove all the sutures, which had sunken deep into the uterine tissue. Several months later four of them encrusted with calcareous salts were evacuated by the urethra. If direct union fails, nothing remains but to freshen both lips of the womb and unite them together, performing hysterokleisis, first performed by Jobert.

L. Landau has recently proposed in cases of uretero-vaginal fistulæ to pass a long elastic catheter from the vagina into the upper end of the urethra, and then to pass the lower end out through bladder and urethra. Then the patient is to be placed in the knee-elbow position, and then the uncovered portion of the catheter to be covered with the vaginal mucous membrane and the lower ureteral wall. The catheter is to remain in situ for some time. If this does not succeed a long oval piece is to be excised from the vesical and vaginal wall, and the direct uretero vaginal fistula be thus changed into an ordinary vesico-vaginal fistula, into the uppermost point of which the ureter opens. Then the vesico-vaginal fistula is to be closed by deep sutures which pass through the vesical mucous membrane.

Simon, however, was led by his want of success in his early attempts to secure direct and indirect healing of uretero-vaginal fistulæ to teach in later years as follows: the vesical wall is to be pierced at the place of the fistula; a sound is to be passed from the bladder into the ureteral opening; and the uretero-vesical wall is then to be slit from the vesical surface for a distance of ⅖ to ¾ of an inch. The edges of the cut are to be daily separated with a large sound until cicatrization has set in. The vaginal fistula now lies at a distance from the new ureteral opening, and its edges can be freshened and united. A small portion of the adjacent vaginal vault could be denuded, and used to help the closure of the fistula. Simon regarded this proceeding as more certain than that of Landau.

Very recently L. Bandl operates as follows on uretero-vaginal fistulæ. He passes a catheter into the bladder and then through an artificial fistula and into the ureter. Then he secures union over the catheter, which remains in place. Thus like G. Simon he entirely neglects the lower end of the urethra; nevertheless he completely cured two patients in this way after many unsuccessful attempts. (See Fig. 54.) Schede thinks unfavorably of Bandl's method on account of the subsequent cicatricial contraction and striction of the ureter. He first therefore surrounds the artificial vesico-vaginal fistula with vesical mucous membrane to prevent future contraction; and he so arranges it that the ureteral mouth forms the outer, posterior end of the artificial fistula. The double fistula is then so freshened that there remains immediately surrounding the fistula a strip of vaginal mucous membrane 1 to 2 lines in breadth. In this way the margins of the fistula are covered with mucous membrane; this protruded into the bladder forms the half of a deep tube entirely clothed with mucous membrane, into whose extreme end the ureter opens. Schede cured one patient in this way.

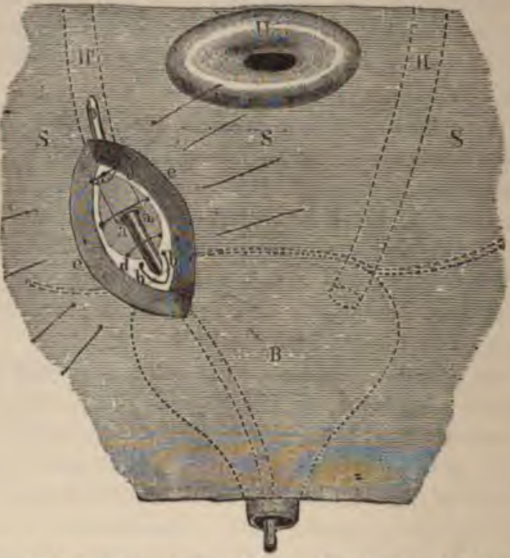


FIG. 54.—SCHEMATIC REPRESENTATION OF THE FIELD OF OPERATION FOR URETERO-VAGINAL-FISTULÆ IN THE KNEE-CHEST POSITION. (After *Bandl.*) *S S*, Vaginal surface. *B*, Bladder. *U*, Vaginal portion. *H*, Right, and *H'*, Left Ureter, opening at *a* in the vagina. *b b*, Artificial opening into the bladder.

Finally, B. Credé and Zweifel cured uretero-uterine fistulæ by extirpating the kidney of the side involved.

In case the opening of the vesico-vaginal fistula is very considerable, Courty gradually closes it by successive incomplete operations done at intervals of 1 to 2 months. If the defect in vesico-utero-vaginal fistula is exceedingly large, Jobert first taught us to loosen the urethra under the pubic arch by the so-called vestibular-incision, so that the urethra could more easily be drawn upwards. Later, however, he abandoned the procedure. G. Simon used it in case No. 2, which had been unsuccessfully operated upon by Bozeman in Heidelberg; at the same time he divided the commissures of the os uteri to the depth of half an inch in order to render the anterior lip mobile. He succeeded in closing the large fistula; but the patient could only completely control her water when lying upon her back; when she stood or walked it began to dribble after ¼ or ½ an hour. Future cases must inform us whether this faulty result was due to the short urethra (½ an inch), or whether the loosening caused it; and if the vestibular incision can be successfully used at all to re-establish continence.

There occur cases, however, in which the loss of tissue is too great to be closed in the manner described; and cases in which the edges of the fistula have become attached to bone, so that there are not sufficient soft parts to be freshened up; cases where the abnormal opening is situated so high up that there is danger of wounding the peritoneum; cases in which repeated unsuccessful attempts at closing have been made, leaving the fistula larger than it was before. In all these instances there remains but one hope for the patient. That consists of closure of the vagina below the fistula, the transverse obliteration of the vagina, or Simon's kolpokleisis. (Fig. 55).

Vidal, and after him Wutzer, Bérard, and Dieffenbach, had proposed in the severest cases to close the vaginal opening; but they none of them succeeded in the operation, small clefts or fistulous tracts being always left. Schuppert of New Orleans is said to have been the first to secure complete closure by means of the so-called episiostenosis, without, however, entirely curing the incontinence. It is very evident that this proceeding, which prevents cohabitation as well as conception, is only to be employed in the most desperate cases, and is always to be done, if at all, as high up as possible. Recently Bozeman, Bouqué and others have claimed that transverse vaginal obliteration has been done oftener than is really necessary. Simon has cured such cases in the ordinary way after dividing the cicatrix. The indications for the operation are to be accepted with great hesitation.

Kolpokleisis is done by selecting portions of the anterior and posterior vaginal wall in the neighborhood of the fistula which will fit to one another, and then marking with the point of the scalpel the limits of the area of tissue to be freshened. (Figs. 55 and 56.) One assistant then with forceps or hooks puts tension upon the part, whilst another pushes it out by means of a catheter lying in the bladder. After smoothing the edges of the wound and stopping the hemorrhage, two needles threaded upon one thread are used to pass the suture through the entire thickness of the denuded surface. The sutures pass from above downwards through the lower, and from below upwards through the upper border. The union should be especially exact at the corners. It is not necessary that the sutures should pierce the vesical or the rectal wall; but there is no harm done if this does occur. They should be passed at distances of about one line from each other.

After the operation is finished the new closed reservoir must be tested

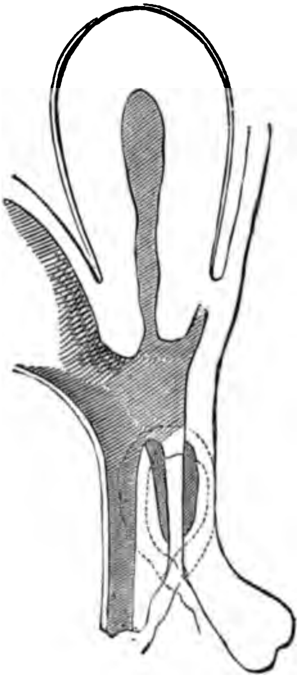


FIG. 55.—DIAGRAM. (After *Hegar-Kaltenbach.*)

by means of injections through the urethra. Everything else is to be carried out exactly as in vesico-vaginal fistulæ. If union is incomplete, pregnancy may ensue even though the opening be very small. As a rule the product of conception is not carried to term; it may make its way into the bladder, or, by enlarging the orifice, pass out by the vagina. (Cases of de Roubaix, R. Lane, and the author, No. 6.) If there be extensive cicatricial stenosis of the vagina, the operation should be done below the scars. In a case in which there was a cherry-sized fistula in the right vaginal vault, Simon obliterated the vagina obliquely, so that the vagina retained its full length, and only half its vault was closed off (see Fig. 57). In another case of kolpokleisis at the level of the urethra the same operator later loosened the posterior vaginal wall from the wall of the rectum, and, covering the latter with a flap, lengthened the vagina ½ an inch. Both operations are by no means devoid of danger. In the first one Douglas's pouch may be opened; and in the second injury to the rectum and re-establishment of the incontinence may easily occur. And the result to be attained is but a small one.

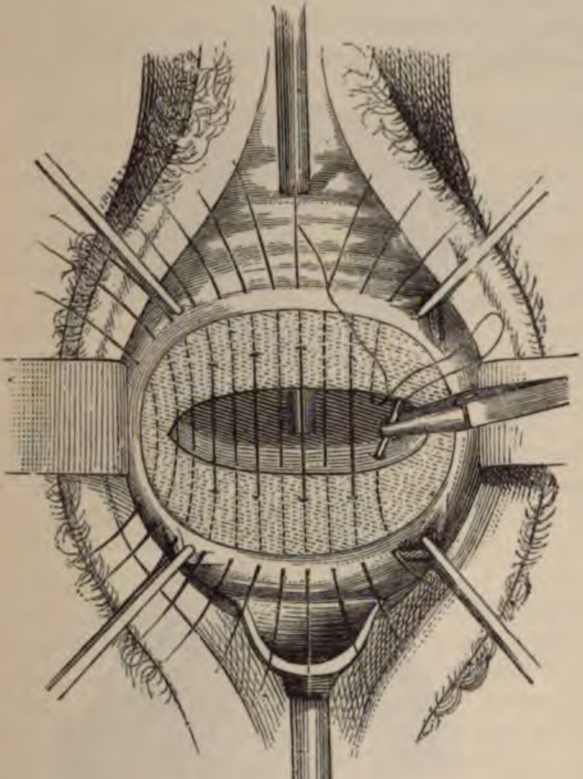


FIG. 56.—TRANSVERSE OBLITERATION OF THE VAGINA. (After *Hegar-Kaltenbach*.)

We have already mentioned the fact (pages 107, 112) that calculus formation is not infrequently seen after transverse obliteration. Tuefferd has recently recorded a very interesting case of this kind. The patient had formerly been delivered by Cæsarian section. Kolpokleisis was done for vesico-vaginal fistula. For a time she menstruated through the lower edge of the scar, thus having a vesico-vaginal and an external vesical fistula. Then she fell sick of cystitis, and several large vesical calculi were detected. Tuefferd opened the vagina and extracted a stone 3 inches in length and weighing 694 grains. The patient died nevertheless.

We are not yet in a position to fully decide upon the merits of the method of transverse obliteration. And although very recently Breisky (1879) and also Schede, have successfully performed it in cases of uretero-vaginal fistula not suitable for direct union, its applicability is restricted to extreme cases only.

We may mention here that in the worst cases of vesico-vaginal fistula, when recovery was impossible, it has been proposed to transplant the ureters into the rectum. This has been done, as we have before mentioned, in cases of eversion of the bladder by Jules Simon; but the attempt is fraught with danger, and it is not to be recommended. Much less dangerous is the plan of first making a good sized recto-vaginal fistula surrounded with mucous membrane, and then closing urethra and vagina, or the entire vulva. This has been done successfully by Antal, Bozeman, Bröse, Kaltenbach, and v. Pippingskjöld. The urine flows into the

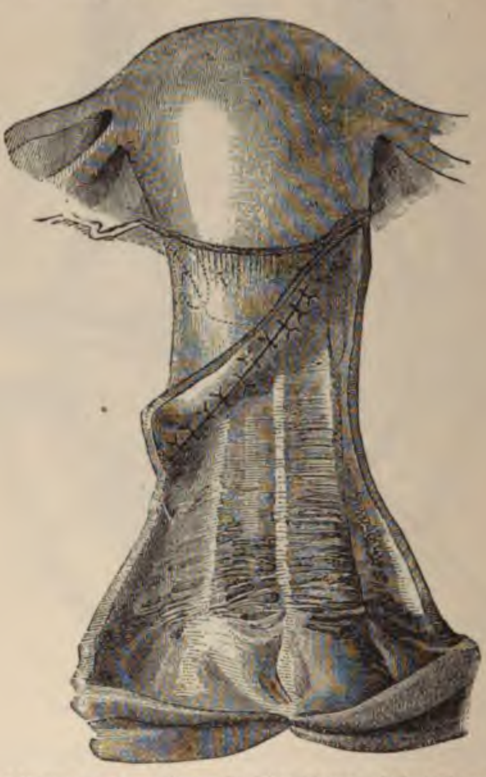


FIG. 57.—OBLIQUE CLOSURE OF THE RIGHT VAGINAL VAULT. (After *Simon.*) The anterior wall of the vagina is removed up to the line of union. The dotted line around *v* is the vaginal part, and the dotted circle around *f* is the fistula.

rectum, and can be voluntarily voided from time to time. For instance Antal's patient passed urine at intervals of ¼ to ½ an hour; the menses passed per rectum; and the organ itself was in no way injured.

Untoward sequelæ of a fistula operation consist mainly of violent vesical spasms, of severe secondary hemorrhage per vaginam or into the bladder, of vesical calculus, peritonitis, etc. Spasmodic contractions of the bladder may persist for 3 to 4 days, are sometimes very severe, and can as a rule only be relieved by opium or by morphine injections in the vesical region. I have several times seen profuse secondary vesical hemorrhage, so that the patient became anæmic, and dilatation of the urethra was necessary to empty the bladder of coagula. The hemorrhage stopped on the injection of cold salicylic acid solutions (1:600) into the bladder. An ice-bag laid upon the abdomen sometimes effects the same end. Hemorrhage into the vagina requires analogous measures, and possibly in the worst case ligature or acupressure applied to the bleeding vessels.

If the urine remains turbid, and pain or hemorrhage persist in a bladder which has been closed, the urethra must be dilated to ascertain by the touch if there are any solid concretions in the viscus; if there are, they must be extracted with the forceps and lavement of the bladder undertaken.

Peritonitis may occur from opening the subserous tissue, cutting the peritoneum or including it in the stitches; but the experience of the ovariotomists has shown us that there must be other additional moments before peritonitis follows such lesions. If it did occur, opium internally and an ice bag to the abdomen would be proper treatment.

If incontinence, partial or total, still persists after a successful operation, Hildebrandt uses cold vaginal douches, and the tampons charged with salicylic acid, or finally applies the pessary recommended by Schatz for this purpose. An instrument of this kind certainly did good to our patient No. 12. In especially bad cases, we can take into consideration the advisability of following Rutenberg's advice (cf. page 207), and, after making a supra-pubic vesical fistula, obliterate the urethra. In one case of this kind I obtained complete continence by narrowing the urethra through the excision of a portion of the urethro-vaginal septum.

C. Pawlik has sought to procure vesical continence by causing lateral stretching and bending of the urethra in the region of the arcus pubis. With a sharp hook he first dragged the urethra to one side, and denuded the space between. This being done on both sides, it was so arranged that the orificium urethræ was dragged up towards the clitoris. Carbolized silk was used; and the operation was done first on one side, and then a week later upon the other.

Patients who will not submit to the operation, or patients upon whom it has either been unsuccessfully done or successfully done without achieving perfect continence, may wear a urinal (see case 1), though its use is sometimes very unpleasant and troublesome. Occasionally the fist when not too large, may be closed by the insertion of a hard rubb cylinder.

Finally it is to be noted in connection with page 32, that very latel Lawson Tait[1] made an artificial urethra with a trocar in the left vagina wall in a case suffering from a large urethro-vesical fistula. Then he completely restored the old urethra by means of side flaps, and closed the new one after having first restored the vesico-vaginal wall.

No. 1. Large *vesico-utero-vaginal-fistula* after *II-face position* with *contracted pelvis; easy forceps case.* In spite of fistula patient had 3 premature childbirths in 3¾ years.

Mrs. K., 28 years old, has had 3 living children born unassisted. A 4th birth (Aug. 1859) waters flowed off one hour after pains began. Sh now complained of desire to urinate, and the midwife repeatedly tried i vain to introduce a silver catheter. I was called, but could not introduc an elastic instrument, the child being firmly wedged in the second fac position in the contracted pelvis. There was considerable swelling of th face, and the heart sounds were inaudible; so I applied the forceps an delivered the head after 1 or 2 attempts at traction. The child had jus died. In 3 to 4 days the woman sent me word that she could no longe retain her water, and when I saw her, on the 5th day, I detected in th anterior vaginal vault a vesico-vaginal fistula half an inch in size, an with uneven, ragged, and tender borders. The patient first wore a sponge then later a urinal; but this latter gave her so much trouble that she soo discarded it. In August, 1850, hardly a year later, the patient had he fifth confinement, and my father was obliged to use the forceps again.

In 1862 she was confined with a small immature child (footling), an in April, 1863, she had her seventh and last delivery, which passed o fairly well. The child was small, and died at the age of one month.

The patient's pelvis was highly contracted; the distance between th spinæ was 9.6 inches, between the cristæ 10.8 inches, the external conju gate was 6.9 inches, the diagonal 3.8, and the true conjugate therefor was 3.2 inches, the left oblique diameter was 8 inches, the right 8. inches.

In the summer of 1864 I had the patient come to Rostock, so that m colleague Simon might operate upon her. We now found a superfici vesico-utero-vaginal fistula, ¾ of an inch long and 1.4 inch broad. Ev dently the fistula had largely increased in size in the three latter deliverie Simon healed the posterior lip in the cleft and obtained good union. Sinc then the patient menstruates through the bladder, and soon fully reco ered her strength.

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[1] Obst. Journ. of Great Britain and Ireland, Aug., 1876.

No. 2. *Rachitic contraction of the pelvis. 3rd pregnancy. Perforation, cephalotripsy, gangrene of the vesico-vaginal wall. A vesico-vaginal fistula appeared on the 7th day.*

Patient 26 years old, 3 children; abortion at 24 years, prolonged labor and still birth at 25 years old. At 3rd delivery the liquor amnii was lost prematurely, and the dolores præparentes were very painful; dilatation of os very slow. The head was high and the patient exhausted; an accoucheur who was called tried to turn; he did bring a foot down into the vagina, but could not turn the child. When I arrived the patient was greatly excited, the abdomen very painful; there was high fever and nausea.

The heart sounds were not audible. I perforated through the great fontanelle, at the left, injected the skull several times with water, applied the cephalotryptor a few times, and compressed the skull on all sides. In spite of this extraction was very difficult. *It needed long-continued and great traction in the first position, and I found several times that the anterior edges of the pelvis were too greatly pressed upon by the blades of the instrument.* Finally a large boy was extracted. In the first few days after delivery, patient was fairly well, save for *ischuria* and pain upon catheterization; but the *discharge smelled very badly. On the 7th day a portion of vagina the size of a dollar suddenly came away, accompanied by a horrible stench; immediately there followed involuntary flow of urine.* The fistula was high up in the anterior vaginal vault. In spite of this the patient gradually recovered, and since a large part of the posterior vesical wall was left, she could retain her urine for a time. She was very cleanly, so that there were no excoriations or ulcers. In fact her general condition was so good, six months after confinement, that although there was a hole in her bladder-wall large enough to pass a finger through, I could not persuade her to undergo an operation.

No. 3. In May, 1870, I examined this case, which was one of *vesico-vaginal fistula due to violence*, with *retroversia uteri* and *atresia orificii externi.*

Patient a primipara, 23 years old, had pains five weeks before the expected time, followed speedily by rupture of the membranes. Six hours later the midwife arrived, and found prolapse of the cord, the head being still high up. She sent for the physician, who is said to have effected external turning of the head, and to have *applied the forceps without success three times during the ensuing night. Then he allowed the patient to remain as she was till next noon; then he again applied the forceps, finally extracting a dead child with the aid of the hook.* After the second operation there was continuous and involuntary flow of urine. Whenever the patient stood up the water dripped. The pelvis was normal, spinæ 10.8, cristæ 11.6. Conjug. ext. 8.6, obliquæ, 10.6 inches.

We found the urethra patent, and in the left side of the fundus vesicæ an oval fistula $\frac{4}{5}\times\frac{2}{5}$ inch in size, from which a cicatricial band extended to the left commissure of the entirely obliterated os uteri. The uterus itself was left retroverted. She had not yet menstruated again. I heard nothing further of her.

In this case very probably the premature application of the forceps caused rupture of the left commissure, and the left blade cut through the vesico-vaginal septum; since there was no mechanical obstacle to delivery.

No. 4. (1871.) *Superficial vesico-utero-vaginal fistula on the 9th day after confinement. Cure in one sitting.*

Mrs. N., 34 years old, 5 children. First 3 confinements normal; an abortion between 3rd and 4th. Fifth pregnancy normal; confinement lasted twenty-four hours. At nightfall forceps were applied effectually. For 8 days she did well, but on the 9th she noticed an involuntary flow of urine. 4 years later she was normally confined of her 5th child, which is yet living. In the anterior vaginal vault 2 lines from the anterior lip is a hole $\frac{2}{5}$th inch in size. Under chloroform I denuded the anterior lip to the extent of $\frac{1}{5}$th inch, and put in 11 silk sutures. (Nov. 28, 1871.) The 3rd stitch to the left ulcerated out, but the spot soon closed under superficial cauterization. The rest of the wound healed by first intention, and on December 12th the patient was discharged from the Rostock clinic as cured.

In this case the location and shape of the fistula, and the history of the confinement show us that the forceps had nothing to do with its occurrence; the soft parts were contused by the child's head.

No. 5. *Urethro- and vesico-vaginal fistula; pneumonia. Death* 6 *months after confinement.* (1874.) No. 109. Mrs. A. Köhler, VII p., 31 years old.

After 6 easy and normal deliveries she was confined of her 7th child 3 months ago. Breech presentation, hydrocephalus, forceps to after-coming head. Slight hemorrhage. 8 days later dripping of urine. Since then is bedridden. Examination shows rupture of the anterior cervical lip, with two urethro-vaginal fistulæ. The patient was much emaciated, and died of pneumonia before any operation could be undertaken. The specimen is in the museum of the Royal Maternity Institution. There is a wedge-shaped loss of tissue in the anterior os, the scar of which is continuous with a fistula $\frac{7}{10}$ inch long by $\frac{2}{5}$th inch broad, situated in the middle of the vesico-vaginal wall. The right ureter is 2 lines, the left 3 lines from the opening. The edge of these fistulæ is in places double. Only $\frac{2}{5}$ of an inch of urethra is left; towards the neck of the bladder there is a hiatus $\frac{1}{2}$ an inch long by $\frac{2}{5}$ inch broad, which is united to the left margin of the upper fistula by a scar. The peritoneum is drawn down almost to the level of the anterior lip of the os uteri; the bladder is very small, and its walls are hypertrophic. There are no traces of perimetritis. The anterior pelvic diameter is 4 inches, the oblique 4⅝ inches, and the transverse diameter of the brim is 5⅝ inches; no great contraction.

The central location and the enormous size of the opening render it probable that the forceps was at all events a partial cause of the lesion.

No. 6. *Large left-sided vesico-vaginal fistula, attached to the left ramus of the pubis.* After an unsuccessful attempt to secure direct closure, *transverse obliteration repeatedly* done.

Mrs. B., 26 years old, a small, stout, strongly built brunette, was confined April 27th, 1874, after a normal pregnancy and a 4 days' labor, and gave birth to a small full-term dead child. The midwife is said to have ruptured the membranes as soon as she arrived, and to have sent for the physician only several hours later. The latter attempted for 2 days, at first alone and then with a colleague, to deliver with the forceps. Finally, perforation was successfully resorted to. Since then the patient has passed urine involuntarily. We found a vesico-vaginal fistula 1 inch in size, the left angle of which was attached by a cicatrical band to the left ramus of the pubis.

April 30th she was operated upon, 15 sutures being passed. When they were removed upon the 6th day, it was found that the angle of the wound in the left vaginal vault was not united. Most of the urine passed by the vagina. On July 20th a ring of vaginal tissue ½ inch in breadth was denuded about 1½ inches from the vaginal entrance, and the wound united with 14 silk sutures. On the 7th day, on removing the sutures, the right and middle portion had healed per primam, the left not at all. Patient dismissed at request. She re-entered May 8th, 1876. May 27th V. abortion. 4 months' fœtus; great pain.

The pelvis is generally contracted; spinæ 9.4, cristæ 10.4, conjugata externa 7. Obliquæ 8.8 inches. July 4th, 1886, 3rd operation. Freshening of posterior vaginal wall for 1½ inches. Then from the left lower corner of the fistula the vesico-vaginal wall was split; and after ligature and torsion had been applied to several arteries, and the actual cautery used for the parenchymatous hemorrhage, the vesico-vaginal wall was united to the denuded portion of the recto-vaginal wall by 18 silver wire sutures. July 11th, 8th day, 14 sutures removed. Union complete. Not a drop of urine passes. On the 13th, the 10th day, removal of last 4 sutures. Urine flows from the left corner, though no opening is to be seen. Later, all her urine passed per vaginam. August 3rd, patient temporarily discharged. October, 1875, transverse obliteration repeated; it was successful in a part, a pea-sized opening remaining to be closed.

No. 7. *Rupture of entire vesico-vaginal wall by forceps in a pelvis con-*

tracted to the first degree. Cure, save for a lentil-sized opening seated near the anterior lip of the os uteri, which resisted cauterization for months.

No. 453. May 17, 1876. S., 26 years old; chorea when a child. July 13th, 1875, delivered by forceps after being 4 days in labor. That same day urine passed by vagina. In the anterior vaginal wall, somewhat left of the median line, is a tear 1½ inch long and ½ an inch broad, through which urine escapes. The vesical mucous membrane projects through it into the vagina. May 20th, denudation begun at lower border of fistula, and made about ½ an inch broad. The end of the freshened area lies about $\frac{3}{10}$ of an inch from the urethral opening. The projecting vesical mucous membrane was cut off. 18 wire sutures were used. May 27th, the 8th day, 16 sutures removed. Union appears to be perfect. June 2d, small fistula found at the upper angle, and cauterized. 2 sutures removed. June 13th, vesico-vaginal fistula entirely cured save for a lentil-sized fistula in front of the os uteri. Ferrum candens used. June 27th, repeated. July 11th cauterization with acid. sulf. concentr. July 14th; only very seldom while standing or walking does a drop of urine escape; none at all passes while lying down. Discharged. Spin. 9.9, Cr. 10, D. obl. sin. 8, dext. 8.6, Conj. ext. 7, diagon. 3.7. In October, November, and December, 1876, the actual cautery was used 9 times, partly perifistularly centripetal, partly intrafistularly; but without curing the little fistula.

No. 8. *Rupture of entirs vesico-vaginal wall, with the stump of the left ureter opening near the anterior lip upon the left side.*

Union of vesico-vaginal wall with 10 catgut sutures; a bean-sized fistula being left, into which the left ureter opens.

No. 241. 1st confinement January 24th, 1875, 5 to 6 weeks too early; premature rupture of membranes; forceps delivery by two physicians; immediate involuntary micturition. Longitudinal tear of vesico-vaginal septum, inversion of vesical mucosa. Opening extends from left margin of os uteri almost to tubercul. vag. Cicatricial band from left border of orifice goes to ascending ramus of pubis. Also a left uretero-utero-vaginal fistula. Operation March 4th, 1876. Freshening of edges of wound $\frac{1}{10}$ inch; same to posterior lip of os. 19 catgut and 1 silk ligature, and 2 tension sutures. Ligatures removed March 18th; save at posterior upper angle, where the ureter is, all is healed. May 30th, the fistula is ½ an inch in front and to left of the left commissure of the os. Funnel-shaped portion excised; much hemorrhage; 5 silk ligatures. R. and L. walls of funnel united by 4 wire and 1 silk suture. At night a considerable hemorrhage from the bladder. June 6th ligatures removed; non-union. July 12th, sent home for 6 weeks. September, and October, 1876, peripheral cauterization of vaginal mucosa around fistula; it became much smaller, and is now bean-sized.

No. 9. *Parturient woman with 4 vesico-vaginal fistulæ; death from entrance of air into the uterine sinuses.*

1874. No. 931. M. 28¾ years old: 3d pregnancy. Rachitis in childhood. 1st birth easy, 2d a cephalotripsy, and since then involuntary urination. 3d confinement in the institution; high fever *post partum;* gases of decomposition from vagina. After expulsion of child, dreadfully stinking gases. Death 4½ hours p. p. Necropsy: Pelvis 10.4 spinæ 11. Conjug. ext. 7.2, oblique 8. Conjugata vera 3.1 inches. Thus pelvic contraction to II or III degree. Absence of greater portion of vesico-vaginal wall. A bridge of tissue .6 inch wide is present, dividing on each side into two arms; hence 4 openings, the lowest and largest being twice the size of a dollar. Edges smooth, in places cicatricial. Vesical wall now ulcerated; anterior vaginal wall below fistula moderately prolapsed.

No. 10. *Small vesico-vaginal fistula in left vaginal vault; spontaneous, from pressure; cure without treatment.*

1874. No. 854. Primipara 28 years, 1st confinement 32½ hours, 2d 28 hours. Child asphyxiated, 20.8 inches long, weighs 90 ounces, and has numerous pressure marks upon head. On 8th day stillicidium of urine from ulceration in left vaginal vault. Closure during puerperium. Small depressed scar on left side of os on dismissal. May 7, 1876, No. 388, second delivery, normal. Conjugata vera 3.9 inches.

No. 11. *Forceps delivery; thin vesico-vaginal fistula cut by R. blade; cure by one cauterization with liq. ferri sesquichlor.*

1876. No. 265. Kurt I. primipara, 28 years old. Child died *inter partum.* Forceps. Dribbling of urine from 2d day. On anterior vaginal wall high up near cervix a small fissure. Catheter showed bladder containing only a little blood. Cauterization with strong liq. ferri sesquichlor. Involuntary micturition decreased day by day; on 16th day discharged cured. Pelvis was normal, and it was only the long duration of the second delivery and the danger to the child from double coiling of the cord around its body, that formed the indication for forceps.

No. 12. *Urethro-vaginal fistula, united by 8 sutures without full restoration of continence; application of a Schatz pessary.*

H., 26 years old, brunette, was rachitic in childhood. Had a dead child at full term May 6th, 1875; turning and forceps to after-coming head. Since then cannot completely control urine. Pelvis: conjug. ext. 7.6, spinæ 8.0, cristæ 9.2, circumference 33.2 inches, a small pelvis. Numerous scars in lower part of vagina; a transverse urethral fistula .9 inch behind orif. ut. ext. There was a small opening drawn high up under the symphysis and going to the bladder; freshened, 8 silver sutures; incision of the lateral cicatricial bands. Complete union; but incomplete power of retaining urine whilst walking and lying. Improved partially by the use of one of Schatz's pessaries.

My father had a very extensive obstetric practice in a district where osteomalacia and rickets are very common, at Gummersbach, in the district of Cologne. In 700 artificial and in part very difficult confinements he only observed the two following cases of vesico-vaginal fistula. In many cases he was only called after labor had been long in progress; and the very small number of cases observed serves to confirm me in the opinion that it is not so much protracted labors and contracted pelves as unskillful and premature use of instruments, that causes the accident.

No. 13. Mrs. M., 24 years old, very small in stature, pelvis rickety and contracted. Conjug. vera circa 4 inches. Pregnancy normal pains began November 29th, 1848. Face presentation. Labor tedious; loud vagitus uterinus; dead child finally extracted with forceps. Pinhead-sized vesico-vaginal fistula. January 1st, 1850, 13 months later, delivered by forceps of a small living child. The small fistula could be distinctly seen during labor, as the anterior vaginal wall was driven downwards by the advancing head. Thereupon the fistula closed completely without artificial aid, as was proven repeatedly years later.

No. 14. Mrs. D., primipara, 28 years, considerable rachitic narrowing of pelvis. November 16th, 1874, confinement; prolapse of funis and hand along side, the head; perforation; attempted extraction of child with forceps and hook by physician. My father then tried the cranioclast in vain, and finally succeeded with the cephalotriptor. Puerperium normal. On arising at the 8th day, urine suddenly flowed off, and examination showed a small gangrenous spot at the vesical neck. Rest upon the side was ordered at once, a catheter introduced, and the edges of fistula touched with lapis infernalis. The fistula was entirely closed in 8 days.

Five Cases of Vesico-Uterine Fistulæ.

No. 15. Case 1. Mrs. Bertha R., 27 years old; second child delivered by version and extraction on account of pelvic contraction; child died during the operation. A few days later involuntary urination. On the left side .6 of an inch from the external os is a pea-sized vesico-cervical fistula. The left commissure is ruptured. The right commissure was then split, and the fistula freshened, and its margins united by 7 silk sutures. Primo intentio. After removing several stitches it was found that the rest were so imbedded in the tissues, that, as their ends had been cut off short, they could not be removed. 6 months later the four that were left came out through the bladder. The patient remained cured.

No. 16. Case 2. Mrs. M., 29 years old, farmer's wife, received October 3d, 1879. Six confinements; 1st, 1870, forceps, 2 to 5 normal, 6th March, 1879, 2 physicians, labor of 2 days. Forceps, turning, and extraction attempted. Child dead. Bedridden 14 days. On 31st day *post partum* sudden involuntary flow of urine, spontaneous evacuation thereafter impossible. Improved, so that while recumbent could retain and pass water naturally. Stools normal.

Vigorous brunette. Uterus movable, not enlarged, anteflected. Portio split in 4 parts by antero-posterior as well as lateral divisions. Anterior lip most deeply cleft; in it is a cicatricial furrow .4 inches distant from the lower border of the anterior lip. A lentil-sized depression in this furrow feels like a fistula. By means of milk injections, the real opening of the fistula was found, in front and to the left of the first opening, which turns out to be the os uteri internum. The fistula is left of the internal and .4 inch from the anterior cervical wall. Pelvis flat, not rachitic.

Spinæ 10.6. Cr. 15.2 Conj. ext. 7.2, Conj. diag. 4.4, left oblique 8.8, right 8.8.

Operation October 7. Two strong silk threads introduced into the anterior and posterior lip; the entire portio drawn down, and so spread as to fully expose the fistulous opening. Circumcision of fistula by means of two oval cuts. Breadth .2, length .6 to .8, thickness .4 inch. Bridge of tissue .1 inch left, between interior os and wound. Direction of cut from below inwards to above outwards; 7 Fil de Florence sutures used. Two sutures were used at the angles of the wound to relieve tension, 3 for deep and 2 for superficial union. The two first were at once tied; the others only after all the sutures had been passed. October 8 to 10, thin bloody vaginal discharge. Regular catheterization. October 11, 1st stool, clysma. October 13th removal of sutures. Complete linear union. Complete continence; bladder spontaneously emptied every 3 to 4 hours. October 17th discharged cured.

No. 17. Case 3. Mrs. A. W., 42 years old, received March 5th, 1883.

Menses regular, moderate, no pain, 4 to 5 days, began at 13¾ years. Last menstruation, end of April 1882. 11 confinements; 1865, 1867, 1868, 1869, 1870, 1872, 1873, 1875, 1877, 1879. Last on February 19th, 1883. First 10 normal; last forceps, dead child, tedious labor, face presentation, according to physician. Puerperium natural. 1874, abortion at 3rd month. Immediately after last confinement, difficulty and pain in passing water. February 27th or 28th patient suddenly noticed that her urine was passing involuntarily. Costive.

Status.—Medium sized, fairly strong, dark blonde. Chest normal. Coughing forces intestinal coils through the navel ring. Uterus enlarged, 2 to 3 finger breadths above symphysis; anteflexed. Vulva livid. Portio soft, turned backwards, several deep fissures; one on right side of posterior lip extends to os internum. In the anterior vaginal wall, just in front of the anterior lip, is a fistula leading to bladder. Fistula well seen with speculum; urine streams from it freely. Little cicatrization around orifice; ovaries normal. Pelvis: Sp. 10.8, Cr. 11.6, Conj. ext. 8.2, both Oblique 9.4, periphery 35.2 inches.

March 20th, narcotized. Fistula brought well into view by loops of thread and hooks. Thorough carbolized injection. Sound passed per urethram into fistula. Above the vaginal opening is found the formerly unseen opening of the cervix. There was thus a vesico-cervico-vaginal fistula. The rupture originally affected the entire anterior lip; but the lateral margin of the cleft had grown together, and there is left a delicate but perfectly palpable cicatrix passing from the fistula over the anterior lip. Thus a bridge was formed which covered the continuation of the fistula into the cervical canal. A broad piece was dissected off all around it, and the margin of the wound united by 11 sutures of finest Listerian silk. Rather more loss of blood than usual. Violent bronchitis soon after operation. Catheterization during first few days; urine ammoniacal. The urethral opening had been drawn in consequence of the operation well into the vagina. March 22d, spontaneous urination; afternoon of same day, involuntary flow again. March 24 to 27, fever; some meteorism and abdominal tenderness (ether, ice-bag). April 2d, removal of most of the sutures; non-union. Complete incontinence. Eczema of nates. April 4th, patient got up; April 19th, last suture removed. Ordered daily introduction of tampons soaked in 2 per cent. carbolic acid.

April 24th. *Second operation.*—Freshening done through the thickness of the vesico-vaginal cervical wall. Union in longitudinal direction of vagina by 7 sutures of Fil de Florence. Operation lasted 33 minutes. Catheterized at first; from April 26th, spontaneous evacuation of urine. Since April 30th, partial incontinence again. May 1st, removal of sutures. The upper posterior angle of the fistula is ununited. May 7th and 10th, the small fistula was cauterized with a small iron. May 26th discharged; complete continence and cure.

No. 18. Case 4. Cresc. E., 31 years old, servant, Munich; admitted May 19th, 1884. Walked at 2 years, menstruated at 15 years. Menses thin, regular, last 3 to 4 days; considerable abdominal pain. March 16th, 1884, first confinement. Spontaneous vertex; stillborn boy, very large and well developed. Liquor amnii flowed off 5 days *ante partum*. Delivery lasted 46¾ hours; small loss of blood. Got up on 9th day. Puerperium good. Suddenly noticed on getting up involuntary flow of urine, preceded for several days by burning pains. Can retain some urine, and evacuate it spontaneously when recumbent.

Status.—Moderately small blonde; fairly well nourished, but weakly. Vulva not reddened, vagina smooth; bathed with urine. Uterus displaced somewhat backwards, well involuted, and not enlarged. Os halfway between anterior pelvic wall and the spine of the ischium. Anterior lip deeply cleft; the catheter in the bladder can be seen to enter the cervical canal. Posterior lip smooth, and fissured in its middle. Bladder contains a small quantity of dark muddy urine; sediment contains some blood cells and some epithelium; no albumen. In the posterior vesical wall, towards the middle, is a pea-sized opening communicating with the cervix.

Pelvis:

Spin. ant. sup.	8.2	inches
Crist. oss. il.	9.9	"
R. oblique diameter,	8.08	"
L. " "	8.	"
Conjugat. ext.	6.8	"
Breadth of R. ilium,	5.8	"
" " L. "	5.8	"
Height of R. ilium,	7.8	"
" " L. "	7.2	"
Conj. diagonal,	3.6	"
" vera,	2.80 to 2.88	"
Distance from Tub. isch. sin. to spin. post. dextr.	7.4	"
" " " " dextr. " " sin.	7.4	"
" " spin. post. sup. to R. spin. ant. supr.	8.	"
" " " " " L. " "	7.8	"
Circumference of pelvis,	30.	"

Diagnosis.—Spontaneous vesico-cervical fistula, with generally contracted pelvis. May 21st, passed 3½ ounces of urine in 4 hours. It is muddy, dark red, contains some albumen and a few red blood cells. May 23d, in 11 hours obtained 14½ ℥. of urine. May 26th, in 5 hours obtained 8 ℥. of urine, light gray in color, non-albuminous; contains pus cells, pavement epithelium cells, and crystals of phosphate of ammonia.

Operation. May 27.—Narcosis; lithotomy position; guttered speculum used for posterior vaginal wall; cervix fixed with 2 hooks. Edges freshened for .4 inch, then smoothed. 8 sutures of Fil de Florence passed deeply. Insignificant hemorrhage. No ligatures necessary. Fluid injected into bladder completely retained. From May 28th to June 1st, spontaneous micturition; urine slightly tinged with blood. June 2, first stool; clyster. June 5, menses. June 7th, removal of Fil de Florence sutures. Complete union. June 8, menses still present; constipation; ol. ricin. Urine completely retained and spontaneously evacuated. June 9th, well; 2 stools; arose. June 12th, discharged, well; no urine passes per vaginam; complete ability to retain.

No. 19. Case 5. B. W., 31 years, workingwoman, Munich, 8 confinements. Married since 1879; admitted November 4, 1884, 2 years ago, after confinement, peritonitis. Menstruated at 16 years, courses regular, last 3 to 4 days, painless. No menses since last confinement, August, 1884, 8 deliveries, 6 spontaneous, 2 operative. Last in August, 1884, protracted, forceps. When getting up, 14 days *post partum*, patient says she noticed for the first time involuntary urination per vaginam. Liquor amnii flowed 3 days before confinement; latter normal.

Status.—Medium sized dark blonde; well developed. Uterus retroverted; anterior lip shortened. Sound can be passed from the urethra through the bladder into the cervical canal, and so out into the vagina.

Diagnosis.—Vesico-cervical fistula in upper third of cervix.

Operation.—November 8, 1884. Narcosis; posterior lip of os dragged down, and fistula thus exposed; it is situated very high up. The freshening includes nearly the entire breadth of the anterior lip 9 sutures (Fil de Florence) passed deeply, and the edges of the wound united. November 9th, frequent desire to pass water; moderate pain in the vesical region. No hœmaturia. November 10th, mucous vomiting in the morning. Vesical pains cease; less urinary difficulty. November 11, persistent desire to urinate, with voidance of small quantity every ½ hour. Orange yellow color; no blood. Abdomen slightly sensitive. (Foment. humid. tepid—vesica glacial. ad caput—Pilul. glacial.) November 12th, urinary difficulty continues; patient passes water every ¾ hour. No strangury. Clothes quite dry. Urine contains some blood. (Menses?). November 14th, complete euphoria. Menstruating moderately. November 15th, sat up 2 hours in bed; dribbling of urine all night and in the morning. No incontinence; voluntary emission. November 16th, sutures removed; several small gangrenous spots; through them the urine percolates. November 17th, increased dribbling; spontaneous motion of bowels; at her own urgent request is given leave of absence. Returned in 4 weeks; no trace of fistula; the small openings had clósed spontaneously. Complete cure.

Communications between the Bladder and the other Abdominal Organs.

There exist a series of other injuries to the bladder, as a result of which openings between and cavities other than that of the genital canal may occur. These other abnormal openings are usually due to disease of neighboring organs, and in far are largely to be regarded as Nature's mode of curing these maladies. Very frequently they cause no trouble until they have effected a perforation of the bladder; so that vesical symptoms may be the first signs of diseases of other parts, and may indeed continue to the end to be the chief cause of trouble. Thus the bladder may be abnormally attached to an ovary, or it may communicate with the cavity of an ovum that has undergone extra-uterine development, or with the rectum, the large or small intestine, or even with the stomach or the gall-bladder.

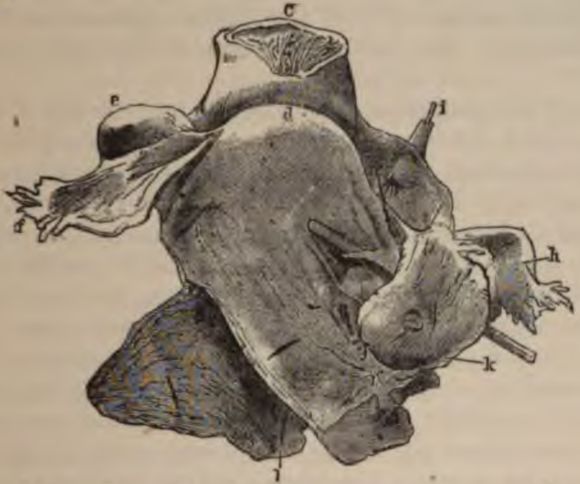

FIG. 58, A.—DERMOID CYST OF LEFT OVARY *k*, UNITED TO THE POSTERIOR BLADDER WALL. *e*, Right ovary. *d*, Uterus. *i*, Left ureter. *h*, Left, *f*, right tube.

Perforations of the bladder by ovarian cysts are not very uncommon. If only fluid contents pass from cyst to viscus, pus, serum, or colloidal fluid, the urine will only be abnormal so long as the communication exists. If the pressure in the cyst be but small, it will close up again after a time, after having caused at most a temporary dysuria and a certain amount of vesical catarrh. This occurred in Bennet's case. It is

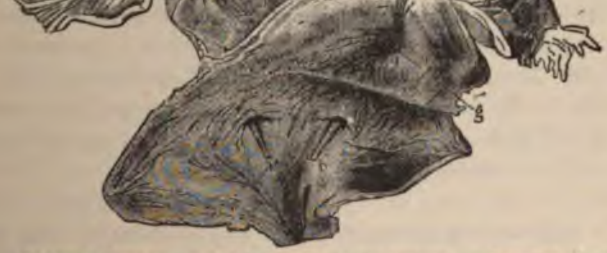

FIG. 58, B.—BLADDER OPENED. *a* and *b*, Sounds in the ureters. *g*, Opening of cystoma ovarii sinistri into the bladder.

otherwise if solid matters pass from cyst to bladder, as has occurred with hair, lumps of fat, and teeth. Obrien (1834), Civiale (1860), Robert Lee (1860), Humphrey (1864), and Blackmann (1869), have removed concretions of considerable size from the bladder, the nucleus of which was formed by a tooth. The best recorded case is that of Sentin (Brussels, 1838.)

Lithotripsy had been tried upon a woman 58 years old, in whose bladder several calculi had been recognized. Later, lithotomy had been done and two stones extracted, the larger and harder of which was adherent to the upper and inner wall of the bladder. The stone was broken during removal, and contained a true tooth for its core. After the patient's death the inner surface of the hypertrophied bladder was found incrusted with urinary salts. The left ovary was hypertrophied, and had a cavity one inch in diameter in its centre. In this cavity was found a lock of hair and a bony mass. As it passed towards the bladder, the ovarian cavity narrowed into a canal 1 inch long, and 2 to 2.8 inches broad, which opened into the bladder. In this canal lay the hollow crown of a rootless tooth; and both crown and hair and bony mass were incrusted with urinary salts, showing that the excretion reached the ovarian cavity. The left tube was turned backwards over the left ovarian ligament.

Besides these cases Delpech, Marshall, Larrey, Hamelin, Philipps, Delarivière and Ruge, have found hair that undoubtedly originated from dermoid cysts in the female bladder. In all but Ruge's case bone was found as well, and in many instances fat and other things. L. Mayer and Ulrich have observed the evacuation of large quantities of fluid fat from ovarian cystomata into the bladder. In some cases the elimination of hairs, bones, teeth, and fat has lasted for years. Since 1877 more cases of perforation of the bladder by dermoid cysts have been recorded, and have been collected by Pincus and Wälle. The case that Wälle describes is pictured in my atlas from the preparation itself, which I owe to the kindness of Dr. Kuhn of St. Galle. The patient was 29 years old, the mother of two children, and was last confined in 1878. Since 1874 she had suffered from hæmaturia, and later had shown symptoms of vesical calculus. Dr. Kuhn, dilating the urethra, felt at the left of the posterior bladder wall, a bony substance, extracted it, and recognized a molar tooth. The vesical wall and the peritoneum was injured during the extraction of another tooth, and the patient died of peritonitis.

Extra-uterine fœtal sacs may penetrate the bladder, and set up inflammatory and suppurative processes in its neighborhood. The fœtal parts possibly pass out through the bladder, but they are more apt to be evacuated per rectum. Giessler in 1856 could only collect 6 cases of so-called secondary vesical pregnancies. The first case was observed in 1714 by Ebersbach. By far the most important and interesting case is that of Josephi of Rostock.

Josephi's patient became pregnant for the second time at the end of February, 1788. She felt no life after the 37th week; from Easter, 1789, she gradually began to menstruate again, and remained fairly well until 1797, save for the occasional pressure upon the bladder of a hard tumor situated in the right lower abdominal region. In 1797 she had chill, colic, pain in the back, and regular bearing-down pains; then an intermitting fever with 3 exacerbations a day, which lasted for 3 months. From this time dated a dysuria which was excessively painful. She had to pass water every minute, and either urinated upon her knees or with her body well bent forwards. At each attempt she passed but very little, and what she did pass consisted of pus and pieces of a thick jelly-like substance. At Easter, 1800, she first noticed a hard body in her urethra, and later in that year she passed her first greyish-white, bean-sized calculus with her urine. Thereupon followed a bone 3.2 inches long, the child's femur; then a calculus; then the petrous bone covered with phosphate of lime; and then 94 millet-seed to bean-sized calculi, one after the other; then some bones of the lower extremities, one of the bones of the ear, six teeth, etc. In 1801 a physician incised the urethra, and successfully removed the lower jaw. At times there was complete retention of urine; the labia were somewhat swollen, and were red and excoriated from the constant trickling of urine. Through the dilated urethra a catheter could be passed into the neck of the bladder, where it at once encountered a large, hard, and immovable body. On account of her sufferings, the patient spent her entire time in a crouching position or upon her knees. The appetite was good, though the bowels were sluggish. When ischuria occurred, as it often did, the urine evacuated with the catheter stunk horribly. Attempts to dilate the urethra with waxen bougies and extract the foreign body failed on account of its size. Therefore Josephi opened the abdominal wall and then the bladder to the extent of 2 inches, and extracted 112 pieces of bone. Three large calculi lay in the vesical neck which could not possibly have passed per urethram. In the fundus vesicæ, where the head had been lodged, was an opening. The patient died upon the third day, and J. now found two openings in the bladder wall; one in the fundus and to the left, the size of a cent, with hard calloused edges, and one high up on the right side, .8 inch in diameter, from which he had with difficulty drawn out the child's head during the operation, and which undoubtedly was connected with the extra-uterine sac.

In Giessler's case (1856) the woman began to pass pus and the bones of a 7th month fœtus per rectum one year after the beginning of her second gravidity.

Urinary difficulties then arose. By means of the catheter bones were detected in the bladder, and were removed per urethram. Defecation was accomplished at times through the bladder, and at times through the rectum. The patient died of exhaustion 3 weeks after the vesical perforation. Examination showed fistulous openings from the sac into bladder and rectum.

Thompson had a patient who believed herself pregnant 7 years. By incising the urethra, he removed from the bladder various fœtal parts. Then from a communicating cavity lying to the left of the viscus, he first drew the fœtal extremities, pelvis, and skull into the bladder, and thus removed them. Save for a moderate incontinence of urine, the patient recovered completely.

B. S. Schultze's case was a similar one. Here a tubo-uterine pregnancy had led to perforation of rectum, uterus, bladder, and abdominal wall. A rib and a vertebra passed first per urethram, and then a large number of small bones. The abdominal fistula was dilated, and the bones extracted. The fœtal sac was then washed out through the bladder, and finally the patient was cured, although the abdominal and vesical openings were patent. There were repeated uræmic symptoms in this patient, which Schultze explained as due to a catarrhal nephritis, caused by extension of inflammation from the mucous membrane of the bladder. In Edgar's case the patient died before the parts of the tubal fœtus could reach the perforated bladder.

Abnormal communications between the bladder and the rectum are extremely rare in women. They most often arise in consequence of abscesses in the true pelvis, or in its neighborhood, which may break into the rectum as they more commonly do into the bladder. Occasionally the position of the fistulous tract is such that while urine may pass into the rectum, fæces cannot get into the bladder, thus giving us a true vesico-rectal fistula. Thus Eble observed a case in a girl of twenty years, who was suffering from suppurating psoitis. 4 to 6 weeks after the beginning of the sickness she began to void pus, blood, and urine per rectum. No urine flowed *per vias naturales*, until the rectal flow stopped. Then it was restored.

If, as in Giessler's case (page 155) the orifice between bladder and rectum is large, excrement will of course pass into the former viscus, and may lead to the formation of stone. Similar, though caused in a different way, was the vesico-rectal fistula which George Glen has described. Soon after an arduous labor his patient had symptoms of inflammatory abdominal processes with marked vesical involvement. She got well for a time; but 14 months later she began to have very painful passages of fæces and intestinal gases per urethram, and died a year later. The walls of the bladder were thin, and at the fundus was an opening which communicated with the bladder. Here an abscess had arisen after the confinement, which had perforated rectum and bladder, and had led to a recto-vesical fistula.

Adhesions between the bladder and the ileum or jejunum can more readily occur, and from the thin walls of the organ involved, fistulæ may be easily produced. Thus van Geuns has described a fistula colica-vesicalis; a quill of moderate size could be passed through the funnel-shaped opening, which communicated with the bladder 1 inch above the rectum. The patient had had cholera 5 years before, and had never entirely recovered. L. Mayer's case is most instructive.

The patient was 28 years old, and had had 2 normal deliveries. Since her second confinement the year before, she had suffered from profuse diarrhœa with meteorism, pains and a tender tumor in the right iliac region. Six months later there set in vesical trouble. The patient again became pregnant, and felt one day, almost painlessly, intestinal gases issue from the urethra. Soon she noticed that her urine was at times greenish or gray in color, very thick, and containing flocculi and bodies that looked like undigested aliment, pieces of potato, muscular fibre, chocolate, etc., which were voided 3 to 4 hours after taking them comparatively unchanged. Blueberries colored the urine blue. The vesical troubles now remitted; the pregnancy ended normally, though the presentation was transverse, and turning had to be employed. Puerperium natural. But the menses did not return, and the diarrhœa became more troublesome, especially at night, when the abdominal pains and tenesmus would awaken her 6 to 9 times. Stools thin, grayish green in color, and contained undigested aliment; they resembled the evacuations from the bladder, but had a more fæculent odor. The tumor was in the false pelvis, but projected into the true one and filled its right anterior upper part.

The urethra was dilated, but the fistulous opening could not be reached with the catheter. Rapid urethral dilatation and palpation of the surface of the bladder had hardly been done at that time. The patient says that when the intestinal contents enter the bladder, she feels as if a burning fluid had been injected, and at once wants to urinate. When she does so the vesical pains become spasmodic, extend into the urethra, and are especially bad when pieces of fæcal matter pass. L. Mayer considered that carcinoma of the intestine was the cause of the perforation, and that the lowest portion of the small intestine was involved. The patient rallied under sustaining and slightly astringent medication, and the diagnosis was not confirmed by autopsy. There might just as well have been an opening between the cæcum or the vermiform process and the bladder, caused by a perityphlitis. And vesico-intestinal fistulæ, whether caused by tuberculosis or carcinoma, would hardly last 18 months, not to speak of the tumor originating 5 years before.

Very recently Valenta (Laibach) has published a very interesting case of this kind.

Patient was admitted in dying condition, and with the catheter there was removed a small amount of urine distinctly mixed with fæces. In subsequent attempts the catheter struck against an impassable but soft obstacle. There was constant dribbling of urine. The autopsy showed the bladder to be enormously dilated, its mucous membrane *in toto* necrotic and covered with urinary sediment. The anterior vesical was so thin and so firmly united to the anterior abdominal wall, that it tore in the attempt at separation. 16 inches of small intestine was adherent to the top of the bladder. There were two openings between the viscera, forming a perfect anus præternaturalis. The urethra had disappeared. Douglas's *cul-de-sac* was completely filled by the non-adherent uterus, which contained a fœtus of 5 months.

Finally, my former pupil, Dr. Heim-Vögtlin, has had a case of vesico-duodenal fistula. 2½ hours after breakfast there appeared in the urine fragments of egg-yolk, ½ an hour later swollen bread crumbs; foul-smelling gases also passed sometimes. She cured the fistula in short order by means of energetic cauterization with nitrate of silver.

I know of no recorded case of direct union of stomach and bladder in the female. It is possible of course that with an enormously dilated bladder and pericystitis, that union might occur with stomach or gall bladder, and be followed by perforation. Gall-stones have been found in the bladder, as have the contents of the stomach; but it has been brought about by adhesion of the right kidney with the stomach or gall-bladder, and thus forming a bridge down to the bladder. Thus Melion has published the case of a man fifty-six years old, who suffered from nephritis calculosa, and who evacuated caraway seeds and vermicelli with his water. In the posterior wall of his stomach was an opening communicating with the right kidney, the pelvis of which contained two stones. The right ureter was dilated, and the bladder contained a hard, hen's-egg sized calculus. The like might of course occur in a woman.

The symptoms as well as the etiology of these various forms of vesical calculi, are sufficiently emphasized by the foregoing examples. Diagnosis is not difficult if we carefully examine the urine both chemically and with the microscope in every case of urinary difficulty. Vegetable and animal cells, remnants of food, will be seen. But to ascertain the seat and size of these vesico-intestinal fistulæ it is necessary to dilate the urethra. As a rule, it can then be well exposed by means of the catheter and sharp hooks.

The prognosis of vesico-intestinal fistula is generally unfavorable. As a rule, though they may be relieved, the patients eventually die of their malady. The case of Heim-Vögtlein (see above) shows, however, that in some cases much may be done by direct therapy. Spontaneous cure also may occur, as in Ed. Martin's case, in which the treatment was dietetic; but this only seems to occur in those cases in which a contracting exudation presses upon the edges of the fistula. In vesico-ovarian and vesico-fæcal fistulæ, the prospects are upon the whole better; they are more ready to close as soon as all foreign bodies have been removed. In these cases Czerny's operation (see below) may be thought of.

Treatment was formerly helpless. Except when the fistula affected the upper part of the rectum or the sigmoid flexure, when Amussat's colotomy could be done and the fæces diverted from the bladder, we could do hardly anything. Now we are able to reach the vesical end of the channel, and cauterize with solid nitrate of silver or chromic acid. Ferrum candens should not be used, on account of the proximity of the peritoneum.

If this does not succeed, Simon and others have recently again recommended the vesico-vaginal incision (see *ante*, page 13), so that the bladder can be inverted and the fistula thoroughly cauterized or even closed by denudation and catgut sutures. The vaginal incision may be operated upon after the fistula is closed.

If the bladder communicate with fœtal sac or dermoid cyst, it will depend partly upon the size of the vesical concrements, bones or calculi, and partly upon the size of the tumor and its liability to rupture whether urethral dilatation, extraction of the foreign body and cauterization of the cavity will be sufficient, or whether it will be necessary to divide the abdominal and the vesical walls and perhaps remove the ovarian tumor. In the case which Pincus has published, where Czerny operated, the dermoid cyst was removed by laparotomy, and the ensuing vesical deficiency closed with silk sutures. Three drainage tubes were placed in the lower border of the wound. The patient made a good recovery, although there occurred a large abscess of the abdominal wall.

In any case it is well to irrigate the bladder as frequently as possible with a lukewarm solution of salycilic acid (1 to 1000) using Hegar's funnel. Mild diuretics are indicated. If the contents of the intestine pass into the bladder it will be proper to use opiates in moderation with a view of lessening peristalsis, as also to exhibit astringents such as decoct. quiniæ, decoct. colombo, rhatany, etc. Suture of the gut has latterly made so good a record that laparotomy with separation and closure of intestine and bladder may well be as feasible as the operation of Czerny above described; though the operation for ileo-vesical fistula will in any case be more difficult and more dangerous than is ovariotomy with suture of a vesical wound.

Rupture of Female Bladder.

Etiology.—This can as a rule only occur when the viscus is subjected to direct violence when in a more or less filled condition. The greater the violence, the less fluid need the bladder contain to cause rupture. A blow, a push, a fall upon the abdomen, a fall from a considerable height upon the feet, may, as Wernher has proved, cause even the empty bladder to rupture. The common causes of the accident, such as scuffling, occur much more rarely in the female. In 86 cases Graw found only 11 in women. In a woman who had received a blow upon the abdomen. Hawkins found two ruptures, one .6 inches long opening into the abdominal cavity, and another opening into the pelvic connective tissue. Possibly also the greater motility of the female bladder and the non-resistance of the pelvic outlet, protects the female, whilst the male organ is more exposed to injury. On the other hand ruptura vesicæ has occurred in consequence of hyper-distension in connection with that diseased state of the bladder wall so often found in cases of retroversia and retroflexio uteri. The most important cases of this class which have been subjected to *post-mortem* verification are those of Gualth. van Doeveren (1765) and Lynn (1767). In other cases, like those of Reinick, William Hunter, and Wall, usually cited in this connection, there was really marked retention of urine with faulty position of a pregnant uterus. In a case that I published myself (l.c. p. 76), when a dying pregnant woman was admitted into the Dresden maternity hospital, the bladder had been dilated until it equalled the size of a child's head; its walls were in some parts thin, in others thickened, and it was filled with muddy, sour-smelling urine. Its vessels were markedly injected, and at the fundus was a space the size of a hand, showing several larger and smaller losses of substance, which were covered with a thick, gelatinous substance of an ammoniacal odor. And all this was after the bladder had been emptied with the catheter shortly before death. It is easy to understand how, with this over-distended bladder, any pressure caused by an access of bearing-down pains, or by an attempt to empty the rectum, these thinned-out places might give way, and rupture of the bladder occur. Krukenberg has demonstrated that with long-continued urinary retention, the termination in rupture is the commoner. In addition to the above-mentioned cases of van Doeveren and Lynn, he has collected one of Hunter (1771), Naumburg (1796), Saxtorph (1803), Moreau (1838), and Southey (1871), of actual vesical rupture. Since the publication of the first edition of this work, we note in addition a case by E. Schwartz,[1] and one by Krukenberg (1882).

Vesical rupture during labor has been mentioned, but I know of no case of the kind. They may possibly occur, but as a rule they are contusions and tears rather than ruptures.

Anatomy.—In Doeveren's case the urinary bladder was found ruptured and the entire abdominal cavity filled with urine. Lynn found 9 to 10 pints of urine in the abdomen; the bladder, torn at the fundus, hung relaxed in the belly; the edges of the wound were gangrenous. Naumburg found an abscess with a fistulous internal opening in the anterior bladder wall, and a small round perforation in the posterior wall. Saxtorph found the posterior vesical wall torn. In Moreau's case the bladder wa attached to the omentum, and showed a gangrenous spot and perforation. Southey found two gangrenous holes in the bladder, the lower one opening into the vagina, near the vesical neck, while the upper one led to a cavity between bladder and uterus, which was formed by extensive adhesions between uterus, cæcum, small intestine, and sigmoid flexure. E. Schwartz's patient had 10 pints of brownish-red fluid in the abdominal cavity; there was a rupture 1.2 inch long in the posterior bladder wall. A similar condition of things was found in Hunter's case. Finally Krukenberg saw the space between the abdominal wall and the anterior surface of the bladder filled with a tissue infiltrated with pus. The pelvic entrance was occupied by the lower coils of the jejunum and the upper ones of the ilium; and two of these coils were adherent, with mesentery, to the edges of a defect in the bladder wall as large as the palm of one's hand, which they closed. In this case it is to be remarked that 11 days after the reposition of the displaced pregnant uterus, a gangrenous membrane 1 line thick and weighing 1771 grains was cast off, which distinctly showed an inner and a peritoneal surface. On the mucous surface were amorphous masses of urates and ammonio-magnesic phosphates.

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[1] 1880, Centralblatt für Gynäkologie, No. 6.

Even the anterior wall of the bladder may suffer rupture; and adhesions to neighboring organs not infrequently encapsulate the effused urine. But the posterior median portion is the thinnest part of the viscus, and hence is the most prone to give way. The direction of the rupture may be oblique or transverse, and the opening in the serosa is larger than in the muscularis and the mucosa. The peritoneal border is sharp, the muscular coat ecchymosed, the mucous layer contains a narrow red ridge from effusion into the submucosa.

In one case, when there was effusion of urine from rupture of the anterior wall, the tissues up to the navel were infiltrated, and only then did the fluid break through the omentum. In 61 cases of rupture of the bladder in both sexes, according to Smith, 50 times it was through the peritoneum, 9 times through the anterior non-peritoneum covered wall, and 2 times through the neck of the bladder. Peritonitis set in in 54 cases.

Symptoms.—Rupture of the bladder with effusion of urine into surrounding parts may cause almost immediately the very severest symptoms of collapse. There is intense pain in the hypogastric region, a tearing feeling, incessant desire to urinate without success, terror, abdominal distension, nausea and vomiting. Whether the urine is effused or not into the peritoneal cavity, there may be peritonitis, clammy sweat, urinous odor of the skin, and a small and very frequent pulse. The urine may be evacuated spontaneously or the catheter may be needed; it is usually bloody, but may be clear. If the rupture affects the anterior wall, there occurs infiltration of urine into the tissues of the abdominal wall. Smith found a fracture of the pelvis in a woman sixty years old who had been run over; her urine was bloody, and there was a painful tumor in the right iliac fossa, from which air, pus, and urine issued on puncture. Infiltration of urine may lead to abscess formation and so to spontaneous cure in these cases, without there being any peritonitis at all. As a rule, however, the pains increase and death speedily occurs.

If peritonitis has been already present, or if other injuries have been caused at the time of the rupture of the bladder, the diagnosis of the latter condition may be very difficult. The excessive desire to urinate will of course lead us to introduce a catheter; and the bloody urine, if present, will lead us to think of a vesical injury. An exact examination, especially of the internal genitals, will, however, guide us aright. An evil-smelling urine points to disease of the bladder wall. If the urine were in the abdominal cavity, we might get no flow through the catheter until its head had been passed through the rent; or it might come now in full stream, and now in dribbling manner. The general picture will be that of a "perforation peritonitis"; and we will not always be able to tell before the necropsy which organ has ruptured.

It is a question whether it is better, when we suspect a rupture of the bladder in an acute case, uncomplicated by retro-flexion of the gravid uterus, to search for the rent with the catheter, or to dilate the urethra and use the touch. There are as many arguments for the one as for the other course. One or other proceeding is necessary to inaugurate a rational treatment. It is objected that thereby the rupture is reopened, the peritonitis increased by renewed effusion of urine, that without narcosis the patient may quickly sink into collapse during dilatation, and more quickly sink if chloroform is used, and finally that we cannot obtain a complete reflux of urine through the rent. On the other hand the greater part at all events of the hurtful fluid can be removed by the catheter. A drainage tube passed through the rent into the abdominal cavity not only permits the escape of all fluids therefrom, but promotes the flow of urine out from the bladder; and all modern experience teaches us how easily and well such drainage tubes are borne, either with or without washing of the abdominal cavity with solutions of salicylic acid. Puncture of the abdominal wall would enable us to empty the peritoneal cavity of the greater part of the urine then present; but it could not be completely done, and would give but poor facilities for drainage. My opinion is that in cases where in women we suspect rupture of the bladder, we should dilate the urethra without narcosis, and thoroughly palpate the internal surface of the bladder.

The prognosis, which is very bad, is the factor that determines me in giving the above advice. It is true that 6 cases of ruptured bladder out of 97 have recovered; but 50 per cent. of all cases died within 5 days, 30 per cent. in 5 to 10 days, and the rest in 10 to 20 days. In infiltration of urine the prospects are of course better. Happily these cases occur but rarely. We must endeavor to bring to their aid all the resources of abdominal surgery which ovariotomy has brought us. In the cases of rupture of the bladder in women mentioned above, death only occurred between the fourteenth and the fifty-first days.

Therapy.—If a patient with the symptoms which we have above described, has fluctuating tumors in her abdominal walls, we would at once, after catheterizing the bladder, incise the spots, and empty them of their contents. If these contents contained urinary salts it would fix the diagnosis.

If there occur a sudden peritonitis from pouring of urine into the abdominal cavity, we should empty the bladder, use ice locally and opiates internally, and await developments. If the threatening symptoms are not much lessened in 1 to 2 days, the time has arrived when we must decide upon the question of exploration of the bladder. In cases where we suspect deep-seated disease of the vesical walls, as in those due to pressure of the pregnant uterus, it is not to be thought of. Krukenberg has demonstrated that even the most cautious manipulations may cause rupture, especially if attempts at reposition be made immediately after the expulsion of membranes clothed with peritoneum. So that vesical exploration from within is only indicated in the rare acute cases of direct rupture. If a perforation was found, and percussion showed the presence of a considerable body of fluid in the abdomen, we would imitate the procedure so successfully carried out in cases of rupture of the uterus, and pass an elastic catheter cautiously through the rent. If large quantities of fluid passed out, we would pass a drainage tube on a stylet through urethra, bladder, and rent into the peritoneal sac, and either leave it there until the symptoms got better, or, if they did not, gradually exchange it for a smaller and smaller tube. As soon as the opening was so small that a tube could only be passed with very great difficulty, it should be discontinued, and the edges of the wound cauterized with the solid stick.

Puncture into Douglas's pouch would only be necessary when there was fluid encapsulated in it, which threatened to suppurate. Otherwise we can only attempt to disinfect it by means of injections made through the drainage tube.

It is needless to say that free movement of the bowels should be attained and the position of the uterus be attended to. As long as there is collapse, frequent hypodermic injections of 30 minims of ether (every ½ to 1 hour) should be persisted in; it not only stimulates the patient, but it renders the bladder less sensitive under the necessary manipulations.

As in cases of acute "perforation-peritonitis," in acute cases of not too extensive rupture of the bladder, the patient's life may be saved by laparotomy with subsequent suture of the bladder walls.

NEW GROWTHS IN THE WALLS OF THE FEMALE BLADDER.

Pathological Anatomy.—The following new growths have been observ as affecting the walls of the female bladder: Polypi and polypoid hyp trophies of the mucous membrane, cysts of the mucous membrane, papi lary tumors, fibroid tumors, fibromyomata, sarcomata, and carcinomat In 119 cases of primary vesical tumor in both sexes, Sperling found 4 fungoid growths, fibromata and papillomata, 19 medullary carcinomat (24 cancers altogether), 6 scirrhi, 10 mucoid polypi, 6 myomata, 7 sarc mata, and 6 fibro-sarcomata. Of the fibromata ⅔ occurred in males an ⅓ in females; and carcinoma was 4 times as frequent in men as in women Rauschenbusch (J. D. Halle, 1882), found 10 females affected in 22 case of papilloma of the bladder.

a. Mucoid Polypi and Polypoid Hypertrophy of the Mucous Membrane —The mucosa is spongy, thickened and soft, either diffusely or ove limited areas. It bleeds easily and is often encrusted with salts. It tissue is infiltrated with a serous or jelly-like matter, its capillaries are enlarged, and on its surface there is abundant cell-proliferation. Muscularis and serosa are usually thickened and hypertrophic. Some polypi are congenital; thus I found in 1875 two pediculated polypi of the posterior bladder wall in a new-born infant.

No. 426. (1875.)—A secundipara had been under treatment for some time for Bright's disease, and gave birth, on May 12th, 1875, at 3 o'clock A.M., to a girl at 8 months, 15 inches long and weighing 43 ounces. The child died in 32 hours. The necropsy showed the subcutaneous tissue to be generally œdematous. Lungs atelectatic in places. Abdomen contained some free fluid. Bladder contracted; mucosa hyperæmic. At the fundus vesicæ was a pea-sized round, soft and vascular mucoid polypus, attached by a pedicle; in the lower part of the bladder was another similar and somewhat smaller one. The walls of the bladder were comparatively thick, and the pelvic and retro-peritoneal connective tissue very œdematous. Single polypi may attain the size of a hen's egg (Hutchinson's cases), and are occasionally found in conjunction with uterine polypi. They consist of a connective tissue of varying density covered by a hyperplastic and fringed mucous membrane (cases of Warner, Guersant, Spiegelberg.) Kaltenbach has noticed a walnut-sized pedunculated papillary adenoma growing from the mucous follicles of the bladder.

b. Cysts of the bladder wall occur in the mucosa and in the ureters. Fuenta says that Paget (Surg. Path. II., p. 84) mentions a case of dermoid cyst of the bladder. Not having access to the original article, I cannot tell whether the cyst originated from the walls of the bladder or whether, as is not uncommon, a dermoid cyst of the ovary had penetrated the bladder. (Page 153.) Campa has described a case in which a serous cyst almost entirely filled the bladder; it contained 8 to 10 pints of a serous, non-albuminous, lactic-acid containing fluid. We have already mentioned (page 80) the occasional communication of large urachus-cysts with the bladder cavity. Finally we may refer to a case of Wagstaffe's, where there was found in the fundus vesicæ a cavity 2 inches in diameter lined with pavement epithelium, and communicating with the tuba and the rectum. It was supposed to be a constricted portion of the vagina (?). The bladder was tremendously dilated.

c. Papillomata vesicæ occur as smaller or larger pedunculated or flat tumors with granular raspberry-like surfaces. They are most frequently located at the posterior bladder-wall in the neighborhood of the trigonum lieutaudii. They consist of papillary excrescences containing well-developed blood-vessels and a fine, loose, connective-tissue net-work, covered upon the surface with layers of hypertrophic epithelium. Birkett found them covered with layers (?) of cylindrical epithelium and some ciliated cells (?). Klebs is of opinion that from the small amount of stroma present, we must conclude that the blood-vessels form the basis of the new growth. The rest of the mucous membrane is usually trabecularly hypertophied, in consequence of interference with the emptying of the bladder by the growth. Klebs also mentions a kind of fibro-adenoma which he has found in the region of the vesical neck and the trigonum lieutaudii. Dr. Heim-Vögtlin has successfully operated per urethram upon 2 cases of vesical papilloma occurring in women of fifty-four and sixty-four years of age respectively.

d. Fibroid tumors and fibromyomata are extremely rare in the bladder. Faye has recorded the only case of fibromyoma in a woman, situated between the anterior bladder-wall and the fascia transversa, and so closely connected with the wall of the organ that it may well have originated there. It was the size of a man's head, had existed for many years, was situated on the right side over the true pelvis, and sent a prolongation the size of an egg along the urethra. It had a tough fibrous capsule and contained muscular elements. Not long ago a myoma of the bladder was successfully removed in Billroth's clinic from a twelve-year-old boy;[1] and R. Volkmann[2] recently extirpated by epicystotomy a lemon-sized polypoid myoma from the bladder of a man. Myoma of the vesical walls thus occurs. Schatz removed a fibro-myxoma telangiectases from the posterior bladder-wall, and Brennecke observed the spontaneous expulsion of a tumor at least as large as a child's liver by a pregnant woman, with bearing-down pains, which miçroscopic examination proved to be a fibromyxoma. The patient made a good recovery, and in spite of the size of the tumor, did not suffer from any incontinence. In the first case, described by Ed. Müller (see next page, carcinoma of the bladder), a fibromyoma was present also.

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[1] Gussenbauer: Langenbeck's Archiv., Bd. XVIII., p. 411.

[2] Langenbeck's Archiv., XIX., p. 682.

e. Senfleben has published the only case of sarcoma of the female bl der that was known up to 1877. The growth was crumbly, was torn the effort at extraction, and had to be removed piecemeal. 4 days lat the patient died of purulent peritonitis, and the necropsy revealed a pe foration of the bladder-wall on the right side of the fundus vesicæ, belo the opening of the ureter. Since that time there have been several case of primary and secondary vesical carcinoma. Thus, we may refer to th case from the clinic of Pernice at Griefswald, described by Siewart. Th girl was three years old, and a spindle and round-celled sarcoma starte from the anterior bladder-wall; it was driven by contractions of the blad der into the urethra, and dilated it to such an extent that even the mout of the womb was distended. Thereupon followed necrosis of portions o the tumor, purulent cystitis, atresia of the left ureter with hydronephro sis, pylonephritis dextra, and purulent peritonitis. Inside of three week there were three times removed portions of the tumor as large as th palm of one's hand; but it always grew again quickly. Another case c primary vesical carcinoma has been described by Dr. Heim-Vögtlin; sh operated upon the patient, who was only fifty-six years old, and who die a year afterwards. Secondary sarcomata from the vagina are not ver uncommon; they have been described by Ahlfeld,[1] Bajardi, 1880, Batti 1880, Sänger (Archiv. XVI. 58), Soltmann.[2]

f. Carcinoma is the commonest of all the new growths of the fema bladder. It occurs sometimes as a diffuse schirrhus infiltration of t bladder throughout its entire extent, sometimes in circumscribed nodule and sometimes as fungating cancer. The latter is the commonest of t secondary forms. It is most frequently situated between the mouths the ureters and the urethra. It appears as very soft and spongy excr scences and prolongations from the mucous surface, with a wide capilla net-work, and an epithelial covering. (Fig. 59.) It is liable therefo to be mistaken for polypoid fibroma of the bladder. In seven prima cancers of the bladder, Heilborn found fungating carcinoma three time myocarcinoma once, cauliflower-cancroid once, and cancroid once. Fö ster has published a couple of cases in which papilloma vesicæ was comp cated with fungating carcinoma.

In two-thirds of the cases of vesical cancer there are adhesions betwe the bladder and neighboring organs, especially the uterus and intestin There are often thromboses of the larger veins, of the femoralis, renali cava, and a. pulmonalis. Purulent thrombi of the vesical neck m cause embolism and metastatic abscesses. Peritonitis is not uncommo Finally the cancerous cachexia sometimes causes amyloid degenerati of the kidneys, spleen, liver and intestine. (Heilborn.) A most inte esting specimen of this kind in the Kiel collection, has been described

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[1] Arch. f. Gynak., XVI., 135.

[2] Jahrb. f. Kinderheilkunde. Leip., 1880–81, XVI., 418–421.

E. Müller. (See *ante.*) The lumen of the bladder was entirely filled by a fist-sized, round, pedicled tumor, which was attached to the upper inner vesical wall. Its color was grayish-yellow, its surface smooth though cleft in places. Its pedicle was an inch in breadth, .4 of an inch in thickness, and .6 of an inch long. The bladder wall was $\frac{1}{5}$th of an inch thick, and the muscle bundles were greatly hypertrophied. The tumor consisted chiefly of a sparse connective tissue with spindle cells, and containing large bundles of smooth muscle. In many softer places were collections of epithelial cell-nests, diffuse cell infiltrations being present only to a small extent. Uterus, tubes and ovaries were normal. Of the history of the case we know nothing.

The cases of primary carcinoma which I have observed have been described by Dr. Bode. (See *ante.*) The only case upon which I had to operate occurred in a woman fifty-six years old; and after a partial removal of the tumor, it grew very rapidly and extended into the urethra. The patient died seven weeks after the operation. The necropsy showed an apple-sized spongy tumor, which included all the layers of the bladder. The urethra also was infiltrated. Another, still rarer, case is one of secondary vesical carcinoma, after primary urethral cancer, I have shown in Fig. 15 of this book.

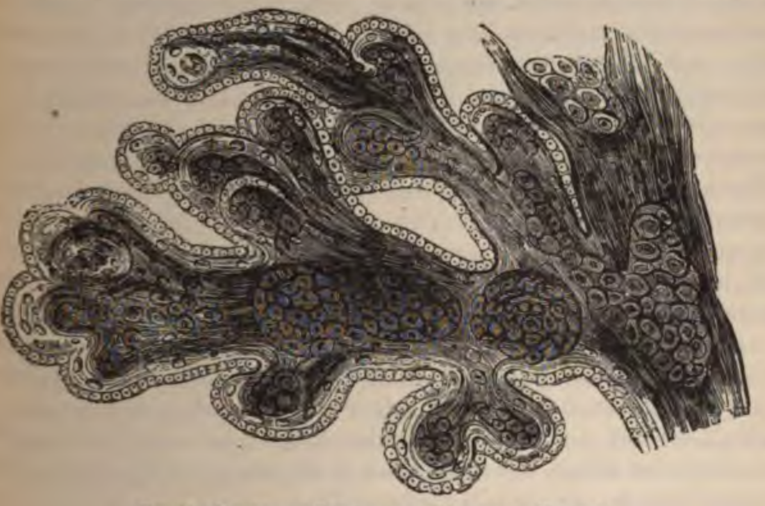

FIG. 59.—FUNGATING CARCINOMA OF BLADDER. (*Demme.*)

Addendum.—Hair on the walls of the female bladder. Trichiasis, Pilmictio vesicæ, have so far been observed only in consequence of the perforation into that organ by an ovarian dermoid cyst. Blich-Winge's case (page 168), though no tumor was demonstrated during life, was found after death to be due to this same cause.

In all these new growths the symptoms are of gradual appearance, and

decomposed; it smells ammoniacal and foul. There may occur a s
stoppage in the flow of urine, while micturating, from the prese
the tumor, or of coagula at the internal opening of the urethra.
cases of Hutchinson, Plieninger, Clarke, Birkett, and in my own,
ments of the papilloma temporarily plugged the urethra. These
portions of the tumor are very liable to become encrusted in decom
urine, and calculous formations are common. This occurred in my
and in those of Coulson and Watson. The pain and hemorrhage
the catarrhal condition of the bladder, together with the dilatation
ureters and the secondary kidney affections, cause cachexia even in
suffering from benign forms of new growth, and cause death by an
peritonitis, or even uræmia. The malady may last for many year
our case it had existed 13 years, in one of Hutchinson's it lasted 6
and in Blich-Winge's 19 years. Appetite and digestion often
unimpaired. In some patients there is an exacerbation in the sym
at each menstrual epoch; and the pains are usually worst when the
is in the recumbent position. Blich-Winge's patient had a cyst
1850, due to perforation of the bladder by a dermoid cyst; the tum
intimately connected with the bladder, into whose cavity it projec
a walnut-sized tumor, and was united to the ovary only by a narrow
Nevertheless the patient only died in 1859.

In cancer of the bladder the secondary nodules appear in kidneys,
stomach, and liver.

The diagnosis of vesical tumors is not always easy. We should
neglect to dilate the urethra in cases of obstinate hæmaturia in w
An exact urinary analysis should of course be made in all cases.
ments of matter may be found in the sediment which can be reco
microscopically, as being papillomatous, or carcinomatous. Catheteri

wall or originates between the bladder and the uterus, or perhaps from the uterus or ovary itself. The presence of teeth, hair, and bones in the bladder show beyond doubt that tumors springing from these last-named organs can perforate the urinary receptacle. We are thus relegated to Simon's specula or Rutenberg's illuminating apparatus, for information as to the seat, size, consistency, moveability, and possibility of operative interference. The illuminating apparatus is especially necessary when we desire to examine new growths, situated upon the anterior vesical wall. We can positively say that many a patient who has perished miserably from hemorrhage, etc., caused by a benign neoplasm of the vesical wall, might have been saved had we known Simon's method before. If after palpation and inspection the histological diagnosis is still not clear, we may scrape off portions of the tumor with the sharp spoon, and examine them microscopically. On the other hand, in no one of these cases is catheterization of the ureters allowable; for as we have just remarked, it is exactly around the ureters that the neoplasmata are most frequently seated. It would not only be difficult to find the displaced ureter, but it would be quite possible to bore through the softened tissues with the instrument. Nor can hydronephrosis, from extension of the growth, be prevented thereby, as Plieninger's case shows. The examination per rectum may be important when the vagina will not permit it in very young girls. But even in these cases the urethra may be dilated to the extent of admitting the little finger, as we shall see when considering the question of the extraction of calculi.

Etiology.—We know but little of the causes of vascular new growths. Carcinoma is generally secondary, and is more common in women than in men. Heilborn found it 37 times in 4778 necropses, in 33 women and 4 men; it being primary in 4 women and 3 men. And since of these 4778 subjects 3043 were males and 1734 females, carcinoma of the bladder is 15 times as common in men as it is in women. In the Dresden hospital it was found more frequently. Among 2505 women it was found 73 times, almost 30 per cent. as against 20 per cent. in Berlin.

As the cause for other neoplasmata is mentioned irritation by foreign bodies, especially fragments of calculi (Hutchinson, Civiale, Birkett), although decomposition of the urine and deposition of calcareous matter occurs in consequence of and secondary to the existence of many vesical tumors.

It is probable that various lesions, contusions, permanent displacements, etc., may be of influence in causing local irritation and determining the formation of tumors in the female bladder; but they appear too rarely for us to admit either these or the puerperal processes as especially active agents in their formation. The number of recorded non-carcinomatous vesical tumors in females increases from day to day, as dilatation of the urethra is more frequently practised. Sutton once extirpated a papilloma of the anterior vesical wall, which was inverted through a ve vaginal fistula caused by confinement.

Hutchinson's case is of interest. A woman twenty-three year over-exerted herself in lifting, and thereupon began at once to suffer

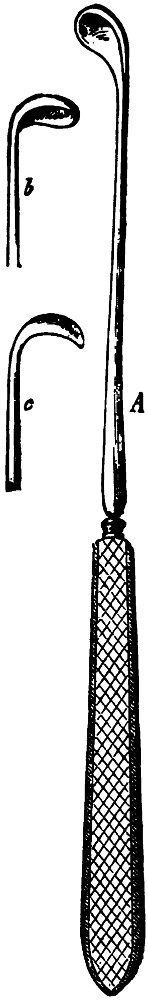

Fig. 60.—Sharp Spoon for Curetting Vascular Growths.

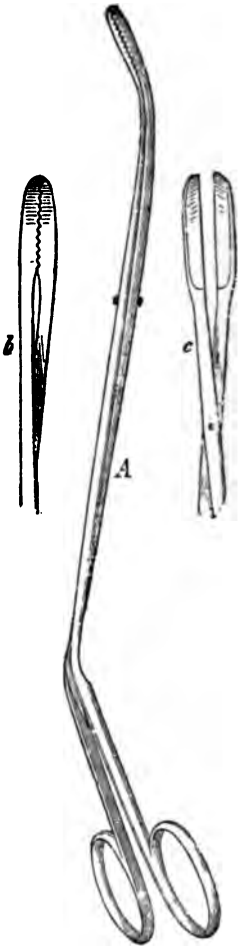

Fig. 61.—Forceps for the Remova Vesical Growths.

pain in the back, retention of urine, until she finally had all the symp of papilloma vesicæ. And in my own case the patient fell with her e weight against a projecting corner and struck the right side of the men; and a year later only she began to notice little clumps of pu blood in her urine. A hemorrhage of the walls of the bladder was ably the starting-point of the tumors in these cases.

New growths of the bladder occur at every age. We have already mentioned two that were congenital. Plieninger's patient was 2¾ years old; Pernice's 3 years, Birkett's 5 years, Hewett's 9 years, Hutchinson's 39 years, ours the same age, Albers' 44 years, Heim-Vögtlin's 54 and 64, Clarke's and Coulson's 63 and 64 years.

Prognosis.—This may be called good, nowadays, for benignant circumscribed neoplasmata of the bladder. They can be removed and the patient cured, always with certainty, and often with ease. The necessary operative procedure is not severe; and even when the tumor is large, a permanent incontinence need not be feared. Warner's patient was cured after three years, Hutchinson's after one year; G. Simon has one who has remained well for five and a half years, though in some of his cases there were relapses within a few months. In my case (see below) there was no return in eight years. One of Braxton-Hicks relapsed in six months.

Carcinoma vesicæ rarely lasts over one year. The secondary form leads to vesico-vaginal fistula in 50 per cent. of the cases, and thus hastens the end. Some few authorities, as Lambl, have held that cancer is less infectious in the bladder than it is in other localities. Probably they confounded it with benign vesical growths; for Heilborn's investigations prove the contrary. Metastases do rarely occur but this may be due to its rapid course, or to its occasional development from a non-malignant papilloma. The prognosis in every respect is very bad. Death does not usually occur from hemorrhage, but from uræmia secondary to hydronephrosis, or septicæmia with peri- or pylonephritis, or septic peritonitis after perforation of the bladder, or numerous metastases.

Therapy.—Warner was first to recognize a neoplasm of the bladder, and at once inaugurated a rational mode of treatment. He removed it as soon as possible, splitting the anterior half of the urethra upon the right side. He then drew out the egg-sized tumor and tied its pedicle. It fell off on the sixth day, and the cure was complete. (1747.) Civiale followed, who used a lithotriptor to crush vascular growths. Hutchinson in 1857 in one case dilated the urethra with Weiss's dilators, in another incised the left side of the urethra, and then tied the tumors. He cured the second patient. The rest, like Clarke, Plieninger, Blich-Winge, confined themselves for the most part to internal treatment, recommending creosote internally for the hemorrhages, morphine hypodermically and by the mouth, and lukewarm baths.

When we have recognized the existence of a new growth upon the bladder-wall, and the possibility of removing it, the patient should be deeply narcotized and put in the lithotomy position. The left index finger is then passed into the bladder to fix the tumor, and Simon's forceps (Fig. 61) passed in. It is then to be seized and twisted off. If too great hemorrhage is feared, the loop of a wire écraseur (Braxton-Hicks's case) or a galvanocaustic wire may be passed over the forceps to the base of the tumor. If the tumor is too large for this, it may be divided into smaller portions by Simon's forceps or sharp spoons, and extirpated piecemeal, or portions may be removed through the speculum.

Schatz in his case incised the right side of the urethra, and, after passing several threads from vagina through bladder and urethra, inverted through the urethra that part of the bladder containing the base of the tumor. He then removed it in two parts, and united the edges of the wound with ten silk sutures. Then the patient was dismissed. These sutures, slightly encrusted with salts, were still *in situ.*

In flat diffuse growths, especially in carcinomata, where radical extirpation is out of the question, scraping must be done with one of Simon's spoons, and all loose portions of tissue removed. If there is much bleeding, cold lavements, or ice water, or direct application of liquor ferri sesquichlorati (Braxton-Hicks) may be tried. The bladder should be repeatedly washed out; and if the bleeding persists the vagina should be tamponed with cotton and an ice-bag laid upon the vesical region. We can then certainly control the hemorrhage.

Finally, in those cases where the tumors and excrescences are situated so high up upon the walls of the bladder, or are so large that they cannot be well extracted even through the dilated urethra, a T-shaped vagino-vesical incision may be made, as Simon has proposed. (Comp. page 15.) The bladder can then be inverted, and scissors, knife and actual cautery be used. Then the vesico-vaginal incision is to be treated as a fistula. Simon removed the above-mentioned papilloma from the vertex of the bladder with the scissors, returned the bladder after cicatrization had occurred, and then performed the regular fistula operation. Kaltenbach made a single incision upon a catheter in the bladder, drew out the growth, tied its base in several places, removed it with knife, scissors and paquelin, and closed the fistula with eight wire sutures. After fourteen days a filbert-sized portion of tissue with the silk threads passed by the urethra. The fistula healed by first intention.

When operative help is out of the question, we can use narcotic irrigations (hyoscyamus), or astringent and styptic ones (liq. ferri sesquichlorati, lec. quercus) or antiseptic ones (Sol. ac. salicyl. 1:500) with Hegar's funnel. Thus we can relieve pain, prevent odor, lessen hemorrhage, and, with warmth externally, and narcotics inwardly, render the dreadful lot of these sufferers more bearable.

Large Papilloma of the Posterior Vesical Wall.—Rapid Dilatation of the Urethra with the Finger, and Extirpation of the New-growth.—Cure. —8 Years later, Cancer of the Bladder.

Mrs. M. S., 39 years old, from New York, had a very itchy eruption in childhood, probably urticaria. At 4 years eat a quantity of unripe plums, in consequence of which she had dysuria; relieved by medicine. At 15 there began regularly returning monthly febrile attacks. Menstruated first at beginning of 16th year, and has had courses regularly every 26 days. Cholera in 1866. 1868 married. Shortly before this she had fallen with the whole weight of her body upon her abdomen against a sharp corner. She feared that she had sustained an internal injury. But the pain, severe at first, gradually disappeared. May 10th, 1869, 7 months after marriage, bore a living girl naturally, after 11 hours of labor. Since then abdomen large. In 1869, child having died, she first felt a paralyzing kind of weakness in the left side of her abdomen, low down. While it lasted she could neither walk nor speak. These attacks began to come frequently, and soon were accompanied by general convulsions. A few weeks later she first found pinhead-sized little masses of pus and blood in her urine. A year later the least motion caused neuralgic and violent urethral pains. The abdomen swelled and became painful, especially in vesical and urethral regions. Appetite enormous; sleep deep. In the beginning of 1872 first noticed movable masses which attempted to flow out of the bladder with the stream of urine. Sometimes they suddenly and completely plugged the passage, and when this happened, there occurred a sudden spasmodic contraction of the muscles, which prevented her from emptying her bladder until she had taken abundant draughts of hot water, and had made local applications of a sponge dipped in hot camomile tea. Soon there appeared a new trouble. Every morning, when the bowels began to act, and wind to pass out, instead of going the natural way, the flatus passed from the right side above into the bladder, feeling, as she says, like a stream of molten lava. Amid the most terrible pain she felt it pass like the smoke from a locomotive among the trees; she felt the presence of a branched growth, but was only laughed at when she told of it. About this time she discovered at the entrance of the urethra a small inflamed tumor, which she touched with nitrate of silver. 3 or 4 weeks later, after passing much blood and pus, there passed from the urethra, with great pains, the 3 first bean-sized growths. A few more followed next day. For a while she felt better; but in a month the pains returned. On October 23d, 1872, Dr. de Moor of New York, after an exact examination declared her trouble to be due to an outgrowth from the right ovary, which had entirely penetrated the bladder. She was painted with tincture of iodine, and in a month the matutinal troubles disappeared, and have not since returned.

The patient's condition remained unaltered until the summer of 1873, when I first saw her. She was a woman of medium size, with grayish hair, and features white and seamed by suffering. She was fairly fat, and her abdomen was tense; hence it was difficult to detect a tumor. Touching the urethra or the vagina was so very painful that she begged for chloroform, which was given her. I could then feel at the right pelvic entrance and near the uterus a projecting, tense, elastic, non-movable tumor, which appeared to spring from the right ovary. Urine was clear and contained no foreign bodies. The patient showed me a mass of nearly hazel-nut-sized warty bodies, sufficient to fill a medium-sized goblet, which she said had in the course of time passed through her urethra. My diagnosis, therefore, agreed with that of Dr. de Moor; a papillary cystoma of the ovary had pierced the bladder, and the bunches were being cast off in this way. No tumor was perceptible to the catheter in the bladder, and there was nothing in the urine; therefore there were no indications for operative interference.

In the next eight months there again began to be fragments passed from the bladder, on one occasion enough to fill a three-ounce vial. There was hemorrhage and pain, and the patient decided to undergo any operation to obtain relief. In order to keep her under close observation, I had her admitted into my clinic June 10th, 1874. There was no fever, appetite was good; costiveness was remedied by injections. Nights were bad, and were helped by small doses of tinctura thebaica. Drinking abundant hot drink, the patient passed June 11th 32 ounces, June 12th 34 ounces, and June 13th 50 ounces of urine with some pus and blood, but no solid masses.

On July 17th she was chloroformed, the urine evacuated with a catheter, and the left finger introduced cautiously into the dilated urethra, into which it passed freely without violence after 2 to 3 minutes. I could then feel on the posterior bladder-wall, at about the place where the right ureter opens, a large, movable, fringed, soft tumor. This I tore into fragments with the finger, and then injected with the syringe about eight ounces of warm water. I then introduced into the bladder a Carus's dilator uteri, and the detached masses passed out in large quantities. I then attempted to remove the rest of the tumor in the same way; but the pedicle eluded my finger, nor could I grasp it with a small pair of forceps, which I introduced along the digit. After three or four attempts, all the prominent parts that I could feel were detached, and were removed in the way described. There was but little hemorrhage; the sphincter closed after withdrawal of the finger, so that no fluid escaped, and after the operation was done, there was only a small fissure in the upper part of the urethral mucous membrane.

The patient finally vomited once while narcotized, and this happened again several times during the next forty-eight hours. But that was the sole reaction that she showed. Pulse remained 72 to 80, there was no fever, and hardly any burning when she passed water. The urine at first contained blood and clots, but gradually cleared. Warm baths were very refreshing to her.

The uterus I found entirely healthy, normal in size, position, and movability. I found no trace of the former tumor upon the right side.

The masses we removed were similar in nature to those the patient formerly passed. They are papillary tumors, each being about the size of a grain of corn. Their surface is covered with hypertrophous pavement epithelium; their mass is composed of a delicate connective-tissue groundwork, with large blood-vessels, which sent delicate vessels up into the papillæ. If there had been a cystoma of the ovary, it would after cicatrization of the pedicle, which connected the part which had penetrated the bladder to the rest, have grown in other directions. This occurs when such growths penetrate the rectum or the umbilical opening. That did not occur. Two years after the operation there was neither any trace of an ovarian tumor, nor any return of the vesical papilloma. In July, 1882, eight years after the first operation, she returned to me, in trouble again. I found the entire posterior vesical wall diffusely infiltrated with a new growth, extirpated a part, and found that there was carcinomatous degeneration. She moved away soon afterwards, and I do not know whether she is still alive.

CHAPTER XIV.

NUTRITIVE DISTURBANCES OF THE FEMALE BLADDER.

ANATOMICAL CHANGES.--The nutritive disturbances of the female bladder are of various kinds; they pass one into the other, and are often only stages of one and the same malady. Hyperæmia is the slightest, though hemorrhages may occur in it. If hyperæmia persist long, there will be hyper-secretion, catarrh of the bladder. If with this the urine is decomposed, there will be croupous inflammation of the mucous membrane, or diphtheritic affections. The muscularis and soon the serosa is involved, until we have the so-called cystitis parenchymatosa and pericystitis, which may finally end in abscess, gangrene, or necrosis of the vesical wall. In many cases we find in one and the same organ the various stages of nutritive disturbance side by side. This Cossy has well described in his case of bladder disease in typhus fever, as also has Krukenberg in his collected cases of gangrene of the bladder.

Of hyperæmia we have an acute and a chronic form. The mucous membrane is colored a more or less vivid red, its vessels are congested, its tissues swollen. If this congestion persists and becomes chronic, there occurs permanent dilatation of the smallest vessels, especially the veins. This condition easily leads to hemorrhages from rupture of vessels. If this occurs below the epithelium, there occur ecchymoses of the mucous membrane only. If the blood is poured into the bladder, it mixes with the urine or it may coagulate. If the blood remains any length of time in the bladder, it forms a coffee-grounds-like mass in the urine. Occasionally a firm fibrinous clot forms the nucleus of a calculus. Severe hemorrhages are especially liable to occur when there are varicosities of the vesical neck, what may be called vesical hemorrhoids. They are especially liable to occur in pregnant multiparæ.

Catarrh of the urinary bladder also may be acute or chronic. In the acute cases there is first dilatation and overfilling of the vessels, the surface remaining intact. After a few days the epithelium, especially at the summit of the folds, is cast off, probably because of the abundant leucocytic emigration. The bladder is usually contracted, and the folds of the mucous membrane contain a milky-white, purulent fluid. The chronic form of the malady is very likely to supervene. The redness and swelling, formerly diffuse, become localized in spots; and the swollen mucosa is bathed with tough mucus or muco-purulent or purulent secretion. The swelling of the mucous membrane increases and may go on to a polypoid hypertrophy. The submucosa and the intermuscular connective tissue now take part in the process; there occur changes in the muscularis and the serosa. Under the influence of the abnormal secretion, the urine undergoes alkaline decomposition, and becomes a fresh source of irritation for the diseased vesicular wall. Incrustations with urine salts occur, and more or less deep ulcerative processes set in. The muscle-bundles withstand the progressive ulceration better than other tissues; they become exposed and undermined, and may be seen as bridges or loose projections in the midst of the ulcerated areas. (Klebs.) The muscularis as a whole is generally thickened.

Gradually the bladder-wall is perforated. Yet fistulous openings into neighboring organs rarely occur. The peritoneal coat becomes thickened, and then occur adhesions between the bladder and surrounding parts. Finally, perforation or infiltration of urine and septicœmia may occur.

The highest stage of inflammation of the bladder-wall terminates in gangrene. The organ is relaxed and dilated, its muscularis is paralyzed, and its contents are changed into a brownish chocolate-colored fluid. The urine contains mucous flakes, blood, pus, and urinary sediments; the mucosa is softened, discolored, black, covered with flakes of mucous or urinary salts; the submucosa and the muscularis are infiltrated with pus; the peritoneum is injected and covered with flocculi of lymph.

Thus we have, as a general thing, the entire wall of the bladder participating in the inflammatory process. We have cystitis mucosa, c. parenchymatosa and c. serosa or pericystitis. Any distinction between these different varieties which we may make at the *post-mortem* table is only valid in so far as it designates the point of origin and chief seat of the malady.

As special forms of cystitis, especially common in females, we may mention the croupous and the diphtheritic types. They may be partial, or they may cover the entire inner surface of the viscus. In croupous cystitis there is found a fibrinous and cellular layer upon the surface of the inflamed mucous membrane, sometimes extensive enough to form a complete cast of the bladder. In diphtheritis vesicæ there is scattered over the surface circumscribed dirty yellow blotches and streaks; the exudate infiltrates the substance of the membrane. There is hemorrhagic injection of all the coats, and possibly ulceration. In both croupous and diphtheritic form there may be partial or total detachmênt of the mucous membrane. Kiwisch, Wittich and others have described vesical croup with expulsion of the mucosa.

In diphtheritis vesicæ, microscopical examination of the membrane will show that a part of the muscularis as well as the mucosa has been cast off, and the exfoliated tissue will be found to be infiltrated with firm fibrinous threads and fattily degenerated groups of small round cells. Such cases

have been observed by Haussmann, Spencer Wells, Barnes, Harley, W
Martin, Luschka, Bauer and many others. Schatz's case (See Fig. 62)
very interesting. The bladder was dilated and its softened walls measure

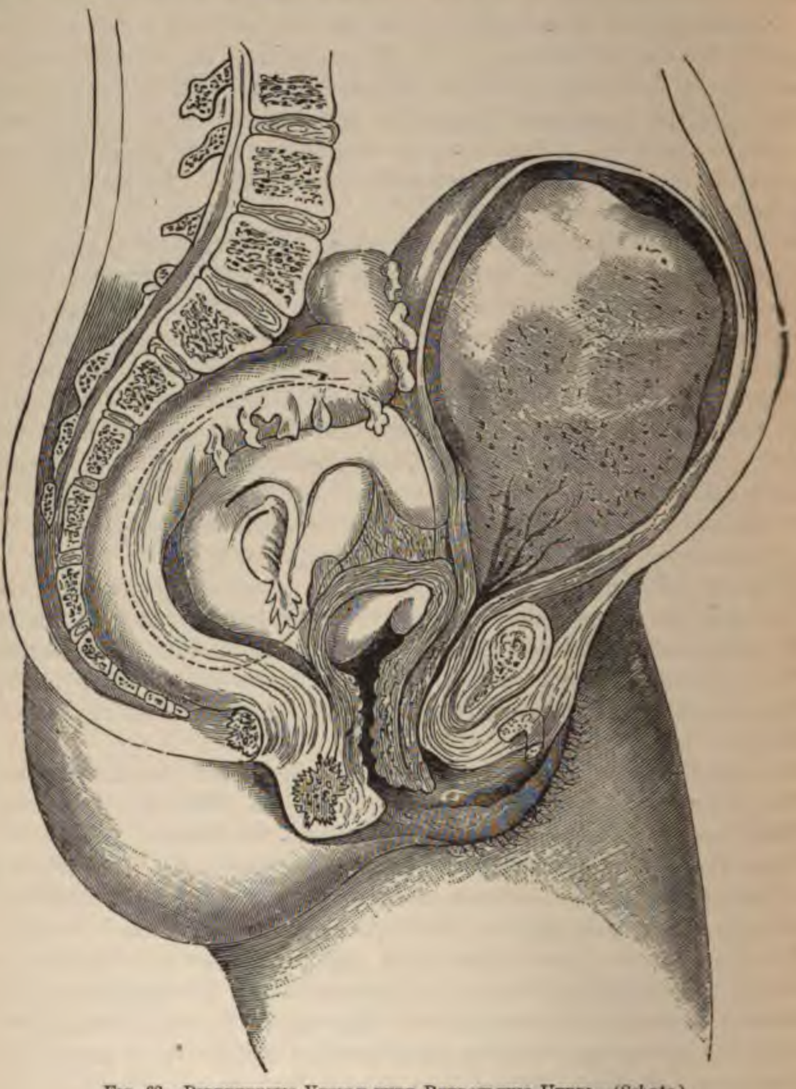

FIG. 62.—DIPHTHERITIS VESICÆ WITH RETROFLEXIO UTERI.—(*Schatz.*)

from 1.2 to .2 inches. Its inner surface was encrusted with urine sal
and it contained free in its cavity a grayish-black bag about the size
a child's head. The walls of this bag were one line in thickness, th
were soft and granular. It was composed of the exfoliated mucosa, w

the greater and necrosed half of the muscularis. It was attached only in the cervical region, where the dead mucosa was still adherent. It had no opening save the one into the urethra. It was 6 inches long by 6 broad. Its walls were composed of four layers. The innermost one was composed of uric acid crystals, elastic fibres, masses of fibrin and detritus; hardly any epithelium was visible. Then came the hypertrophied submucosa, with many young cells and nuclei. Then followed a layer of muscular tissue $\frac{1}{12}$ of an inch thickness, the connective-tissue framework of which was greatly hypertrophied, and studded with small degenerated hemorrhagic foci, fatty cells, etc. Finally there was a layer which was wanting in parts, about the same thickness as the last one, and composed of fibrin, detritus, fat granules and pus, with connective-tissue bundles. This last layer was due to the previous hemorrhages and secondary inflammations of the bladder wall. The vesical wall that remained was composed of only two layers; a necrotic inner one, containing detritus, fat granules, fibrin, pus, fresh spindle cells, uric acid and hæmatoidin crystals; and a white, firm, still living layer infiltrated with leucocytes. Schatz remarks that the case is a most typical one of gangrene of the mucosa and the muscularis due to diphtheritis. The patient had suffered from retroflexio uteri gravidi with constriction, and died seven hours after giving birth to a fœtus 6 inches long and weighing 4½ ounces.

Tuberculosis of the urinary bladder is extremely rare in women. Klebs is of opinion that it is found exclusively in the male sex; since the genital apparatus forms its starting-point, and that of the female gives but little chance for neoplastic processes to progress by continuity. There are, however, a few cases in which tuberculous ulcerations have occurred in the walls of the female bladder. Thus Albers found around the urethra and in other places, in a woman forty-four years old, groups of larger and smaller tubercles and ulcers. The left ureter was full of tubercles, and the medullary substance of the left kidney had undergone complete tubercular degeneration. Scanzoni mentions such a case. Prescott Hewitt had a girl nine years old, in whom the bladder-wall was so perforated that it opened on the one side into the peritoneal cavity, and upon the other side into the rectum. The mucosa vesicæ was much thickened by tubercular deposit, and showed many ulcers. Finally, among the 2505 necropsies on female subjects which we mentioned in the introduction, there were four cases of vesical tuberculosis. They are as follows:

No. 1. (May 11, 1860, No. 83.) Woman 31 years old, died of tuberculosis of lungs, with general glandular induration, infiltrated tubercles of right kidney, both ureters, and bladder. The latter contained a thin, dirty-gray mucus. The entire mucosa was studded with pinhead to pea-sized pale gray tubercles. The larger nodules were flat, and had in part ecchymosed edges.

No. 2. (January 24, 1864, No. 21.) Patient 66 years old, had died of fracture of the neck of the femur and miliary tuberculosis of the lungs and the liver, with tubercular infiltration of the pelvis of the right kidney, of the right ureter, and of the bladder. The vesical mucous membrane was extensively infiltrated with tuberculous masses, and had also an irregular ulcer with swollen hemorrhagic edges.

No. 3. (June 14, 1869, No. 180.) Cook, 63 years of age, died with pneumonia of the left lower lobe with induration of entire lung. Bronchitis, emphysema. Cheesy infiltration of kidney; enormous hydronephrosis of right kidney with great dilatation of the ureter. Hypertrophy of the vesical wall. Tuberculous process in vesical mucosa, and purulent interstitial cystitis.

No. 4. (1876, No. 90.) Patient 29 years old. Dead of excavations of upper lobes of lung. Peri-bronchitis nodosa. Adhesive pleuritis. Diffuse deep ulceration of small intestine. Tubercular ulceration of posterior bladder wall, pea-sized, and with swollen, hyperæmic edges.

In the four cases of vesical tuberculosis which the autopsy books of the Dresden hospital record, two were plainly secondary, one to pulmonary and the other to renal and ureteral tuberculosis.

Kussmaul claims that tuberculosis of the urinary passages rarely lasts longer than one to two years.

There has recently been described an extremely interesting form of chronic catarrhal cystitis with the production of epidermoidal concrements. Rokitansky long ago described as a sequel to chronic catarrhal cystitis a condition of epidermoidal hypertrophy of the vesical mucosa, leading to the exfoliation of thick, shiny-white layers of epidermis cells. Löwenson (1862) has described the most instructive case of the kind occurring in woman. The patient had mitral stenosis, and arrived at the hospital moribund. After death the bladder was found to be enormously dilated. In it was found a mass weighing 3¾ pounds and composed of small yellow round bodies, with a few shining discs interspersed, like a mass of boiled split peas, with a few beans in it. The entire inner surface of the bladder was coated with these same placques, which were $\frac{1}{25}$th to ½ an inch thick. The entire layer was elastic, and had a dull mother-of-pearl glance. After removing this pavement epithelium, other membranous layers could be stripped off from the mucosa. Urethra and ureters were normal, kidneys in condition of granular atrophy. Microscopic examination showed that the epithelial cells of the mucosa had gradually acquired the properties of large epidermic cells, and were mostly without nuclei and granular. The spheres were composed of granular fat, lime, nucleated and epidermic cells. They contained stearin in abundance, but no cholestearin (which Reich—see Virchow-Hirsch Bericht f. 1875, II., 255—has lately found in the vesical mucosa of a man suffering from chronic catarrh of the bladder). The bladder-wall was hypertrophic.

Löwenson ascribes the degeneration to a great epithelial overgrowth, with rapid degeneration and change into epidermic cells, while the bladder was in a continuous state of inflammatory irritation.

Symptoms.—We can be brief as regards the symptoms of hyperæmia, acute and chronic catarrh of the bladder, since they are well known and have been thoroughly described in these volumes by Podrazky III. We will confine ourselves mostly to the symptoms of croupous and diphtheritic inflammation. These consist of disturbances of function, dysuria, strangury and tenesmus, and not infrequently ischuria. There are pains after passing water, which radiate up to the kidneys. Then occur the urinary changes; the water becomes ammoniacal, it often contains blood, pus, epithelial cells, urinary sediments, and causes croupous inflammatory reaction in the parts which it flows over during evacuation. Thus in Bauer-Luschka's case, the entire vestibule was coated with a ragged membranous layer, which was saturated with foul-smelling urine. The entire urethra is swollen, and becomes very sensitive. Not infrequently there now appear shreds and flocculi in the urine; the urethra may be plugged, the stream of urine broken, and even complete ischuria occur. Finally by increased abdominal pressure or by artificial means, the obstruction is removed. These flocculi may attain a considerable size. In Schatz's case (Fig. 62) and in that of Kiwsich, they were as large again as the palm of the hand; in Godson's case, as large as a clenched fist, and in Haussmann's 2 inches in diameter.

In cases of ischuria due to plugging in this manner, it has often happened that the urine could not be evacuated, either by soft or metallic catheters. In piercing the soft mass, their fenestra become plugged up. In Bauer's case the bladder had to be punctured in consequence. Kiwisch also failed in the same manner; but after extracting the mass he drew off three pounds of urine. Schatz could get nothing with the male instrument; but with the elastic catheter he evacuated nine pounds of urine. Gradually the symptoms of urinary stasis appear. There is continual desire to pass water, the appetite fails, there is nausea and gagging, and constipation alternating with diarrhœa.

Not infrequently peritonitis supervenes, as it did in the case recorded above. Nevertheless Whitehead rightly calls attention to the fact that the general symptoms are often but very slight, in comparison with the gravity of the affection. Eclampsia has occasionally occurred in connection with a chronic catarrhal cystitis in gravidity. (See Vinet's case.) Abortion frequently occurs; in Whitehead's case the expulsion of the loosened portions of mucous membrane preceded that of the child by several hours. But there are cases, as one of Haussmann and one of Madurovicz[1] show, in which in spite of the exfoliation of a large part of the mucous membrane of the bladder, and in spite of high fever, the pr nancy is not interfered with.

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[1] Wiener Med. Wochenschr, 1877, parts 51 and 52.

In unfavorable cases death occurs with uræmic symptoms, or with p tonitis and collapse. Patients who are seized with severe general diseas typhus, uterine diphtheria, smallpox, etc., may easily have their vesi symptoms so masked as to be very misleading.

Löwenson's patient only entered the St. Petersburg hospital a few d before her death; she soon sank into a soporose condition, so that exact symptoms of this remarkable form of chronic cystitis with epid mis production could not be observed.

Diagnosis.—When a woman complains of urinary difficulty an ex digital and specular examination of the internal genitals should be ma The orifice of the urethra should be examined, new growths in it loo for, the catheter introduced and the posterior bladder-wall examined w it. Then the urine that is drawn off should be examined for album vesical epithelium, casts, blood, fat, vibriones, crystals of ammo magnesic phosphate and membranous shreds. Sometimes the tender of the bladder-wall itself will inform us that we have to do with inflammatory affection of that viscus. To determine its exact s and extent, and especially to differentiate it from fissure of the n of the bladder, to which Voillemer, Guéneau de Mussy, and Spie berg have especially drawn attention, the urethra must be dilat and the collum vesicæ examined by palpation and inspection. At same time we may make direct medicinal applications, and extract ex liated portions of the mucous membrane. But most important in all s cases is the microscopic examination of the fragments extracted or pass That only can inform us whether the material is really a portion of vesical mucous membrane, whether we find in it pavement epitheli fibrin threads, mucus or pus cells or smooth muscular fibres, or whet it is material that has come from without, from echinococcus-sacs ovarian cystomata (containing hair, heaps of epidermic scales, etc.), whether even, as I once found, and as did Professor Franz Eilh Schulze, it is composed of matter containing straight canals, in wh we can recognize kidney structure. Since in many of these conditio as, for instance, in diphtheritis, the vesical walls may be extremely s we must refrain from inflating the bladder with air and using the mir The lower abdominal region is of course to be examined by palpati percussion, and auscultation; the amount of distension of the bladd the tense or relaxed condition of its walls, and the existence of a frict sound are to be thus determined.

In diphtheritic processes in the genitals of puerperal women, in typ fevers, but especially in retroversion of the pregnant uterus, a const watch must be kept upon the condition of the urine, lest the beginni of a croupous or diphtheritic affection of the bladder be overlooked.

Etiology and Occurrence.—Among the 2500 *post-mortem* examinations of female subjects mentioned on page 25, inflammatory processes of the bladder were found 68 times, 2.7 per cent. of all cases, and 38.3 per cent. of cases in which any anomalies of bladder and urethra were found. Hyperæmia was found alone 4 times, ecchymoses and hemorrhages 21 times, vesical catarrh 16 times, purulent cystitis 16 times, croupous 4, and diphtheritic cystitis 5 times, abscess of bladder 3 times, metastatic abscess once, chronic cystitis 4 times, œdema of vesical wall and its neighborhood twice, pericystitis once. Thus inflammatory affections of the bladder are important in women, and there is no doubt that it is the puerperal processes especially that predispose them to them. Two conditions are especially prone to do so. One is retroflexion of the pregnant uterus with retention of urine, and the other is the early ischuria of the puerperal period. Virchow holds that ammoniacal decomposition of the urine from one cause or another must occur before the epithelium can be loosened and the bacilli obtain a lodgment in vesical diphtheria. As May (1869) has proved in dogs, the loosening occurs first at the apex of the bladder. Mucosa and muscularis are separated from one another, and the space between them is filled with blood or serum or urine that has percolated through. The mucosa of the vesical neck is generally preserved, as Schatz has shown, and cure is thus rendered more easy.

A simple spontaneous catarrh of urethra and bladder, such as occasionally occurs in pregnancy from pressure upon the urethra and the vesical neck, or repeated catheterization, may give rise to this decomposition. Fischer and Traube, Olshausen and Kaltenbach, have fully demonstrated this fact. The latter proved that vesical catarrh during the puerperal period might be due to chemical or mechanical irritation from the catheter, or to spread of inflammatory affections from the sexual organs to the bladder, or from traumata during delivery. P. Dubelt proved by experimentation upon dogs that the injection of air into the bladder had no effect; that decomposed urine injected into a healthy bladder caused but slight inflammation; but that it was much more effective as soon as the vesical mucosa was injured. Frequent introduction of the catheter he found to cause circumscribed redness at the place where the catheter touched, with loss of the epithelium there.

Besides these chief predisposing causes, certain general ones remain to be mentioned. These are: Cardiac lesions (Löwenson's case), typhus (cases of Cossy and Ebers), small pox (Cruveilhier's case), paraplegia, spinal diseases, extreme old age (case in *Lancet*, see above.)

To these we may add diseases of vagina and uterus, especially cancer of these organs, perforating fœtal sacs, etc. In some of these cases the cystitis undoubtedly occurs spontaneously. Probably in all these cases a ferment is carried in from the vagina, which determines the alkaline decomposition of the urine. Klamann found on the vesical epithelium both bacteria and leptothrix. A healthy bladder with smooth walls and a vigorous muscular structure, soon expels the offending matter; not so one irritated by the presence of a foreign body, a catheter, or a new growth.

Prognosis. — Simple hyperæmias, hemorrhages and catarrhal conditions of the female bladder are of good prognosis. The entire inner surface of the bladder can be washed out easily and without much pain, and uncomplicated cases can usually be cured in eight to fourteen days. It is otherwise with croupous, diphtheritic, or gangrenous processes, which are more serious. Of eleven recent cases 5 or 45 per cent. succumbed (cases of Bauer, Schatz, Spencer Wells, Krukenberg, and Schwartz); and six recovered, (cases of Spencer Wells, Wardell, Haussmann, Kiwisch, Frankenhaüser, and Madurovicz.) The earlier the cause of the trouble is recognized, the better the prognosis; and the longer the ammoniacal decomposition of the urine persists, the worse it is. High fever, considerable swelling of the urethra and the anterior abdominal wall, and acute œdema in the neighborhood of the bladder are unfavorable, being symptoms of threatening vesical perforation. Adhesion of the bladder to neighboring organs may have an unfavorable influence, since it favors retention of urine, the entrance of air during catheterization and recidives of the catarrh and inflammation.

It is very evident that the prognosis may depend to a considerable extent upon the matter coming from the mucosa; it being better in cases of simple croup, where only epithelium and exudate is demonstrable, than in cases where portions of the muscularis or even gangrenous pieces are present.

It may also be mentioned that adhesions of the bladder to the intestine have subsequently caused a fatal ileus.

Therapy.—To prevent hyperæmia of the bladder, we must regulate diet and drink in those predisposed to it. We must see that gravid women keep the abdomen and feet warm, and preach especial caution in cases where there is the least difficulty in voiding urine, even if due to purely mechanical causes. If there be constipation, we must use lavements, mild cathartics like magnesia, rhubarb, sulphur, calomel, and cause moderate rectal and intestinal irritation, so as to exercise a derivative influence upon the bladder, and preventing straining at stool. It is of great importance in any case in which we have to use the catheter, not only to disinfect it with corrosive-sublimate (it should, if frequently used, be kept in a 1 per cent. sublimate solution), but also to be careful that no air enters the bladder while it is being used. In Rutenberg's method we do, it is true, distend the bladder with air; but it immediately escapes through the dilated urethra, and we always use antiseptic injections thereafter. Nevertheless we have twice observed a temporary vesical catarrh after its use. In all maternity hospitals every puerperal woman whose urine requires drawing off, should have a new or a chemically cleansed catheter for her own use alone. This has long been the custom in the Dresden Institute, and to it I ascribe the extreme rarity of puerperal vesical catarrh there. I think it would be well if the same thing were done in private practice, and each patient required to buy a new instrument for herself.

If, however, hyperæmia or cystitis has set in, it is my experience after many years that, whether it be in full-grown women or in little children, the local treatment is of the most importance. I always begin by washing out the bladder with lukewarm water or linseed decoction or lime water; and to one of these I often add salicylic acid (1:1000) or 3 per cent. of boracic acid. The fluid must be at blood heat, and is best applied by means of a Hegar funnel, which should not be held too high up. An elastic catheter is attached to the tube and introduced into the bladder. The fluid is permitted to remain in the viscus a few minutes, and is then withdrawn by sinking the funnel. The amount to be used varies with the patient's age and the size of the bladder; from one to two pints should be thrown in, and the injections are to be repeated 1 to 3 times daily. This may be kept up for weeks. When it appears to be of no service, I have recourse to solutions of nitrate of silver 1-2-3:500, or tannin, 10 to 15 grains to 4 ounces. I have never been tempted to try the various other injections which have been recommended, since I have always obtained the desired result by the above means. I order rest, in bed if there is much tenderness, warm abdominal applications, and a simple fluid diet of milk, tea, yolk of egg, bouillon, and lean meat; rectal injections, and the cathartics above recommended, may be used to regulate the bowels. I have never used balsam of copaiva in these cases, and I think we can well do without it. Nor have I tried bromide of potassium, lately recommended by Meinhard for cysto-blenorrhœa. But I can recommend the continuous use of chlorate of potash (5:175) in tablespoonful doses 4 to 6 times a day. A somewhat different method of local treatment was recommended by Braxton-Hicks two years ago. During the acute stage he first washes out the bladder with two pints of fluid composed of two drops of hydrochloric acid to the ounce of water. Then he injects a solution of morphine, 1:600, which is to be retained as long as possible. Two repetitions, he says, are enough. If the urine is acid, mild carbonate of soda solutions are injected twice daily. After the acute symptoms have passed off, tannin or solutions of 3 to 4 drops of liquor ferri sesquichlorati to 6 drachms of water are injected. For chronic vesical catarrh he uses nitrate of silver 1:60 to 1:40 and liquor ferri 3 times as strong as he used during the acute stage. He applies this same irritating treatment to the urethra also, as a means of counter-irritation, introducing sounds coated with nitrate of silver or tannin-covered elastic bougies. He also recommends dilatation of the urethra and pencilling of its mucous membrane with a solution of sulphate of iron.

Lemaistre-Florian claims to have cured chronic cystitis in twenty-one days by means of solutions of sodium chloride 4:1000 and increasing, given three times daily for twenty-five minutes. It was formerly the custom to draw blood locally by means of leeches and wet cups. Barnes, Parrisch, Teale, Gardner, Davidson, and many others have latterly praised rapid urethral dilatation as one of our most important weapons for fighting cystitis.

It is of great importance in the treatment of these cases, not to let the urine remain stagnant in the bladder for any length of time, but to have it emptied regularly and completely, if necessary, with the catheter. Fritch recommended a non-fenestrated rubber tube 6 inches long and .2 inch thick, and disinfected in a 5 per cent. carbolic acid solution. It was to be only introduced until the urine flowed. The bladder was to be washed out through it with a 1 per cent. carbolic solution 3 to 6 times a day. It may remain *in situ* 3 days, but must then be removed on account of the danger of deposition of urinary salts. Schücking recently applied permanent irrigation of the bladder in 6 cases for 1 to 3 days, using a 10 per cent. solution of sulphate of soda with the addition of 5 per cent. of glycerine.

General warm baths are very grateful to the patient. As drinks, milk of almonds, Vichy, soda, etc., may be used.

We have already described the treatment for hemorrhages of the bladder. We can recognize with the catheter the presence of a considerable amount of coagula, and dilating the urethra, let them out or extract them with forceps, and then washing out the bladder with very dilute liquor ferri sesquichlorati, continue the treatment.

When membranous matter has passed per urethram, the catheter should be employed, and dilatation, if necessary, effected. Then lime water or carbolic solution 1:1000 or salicylic acid solution, or, if there be bleeding, a solution of liquor ferri sesquichlor 1:800 may be used, the membranes having previously been extracted with the forceps.

In all these cases we shall have to use anodynes occasionally; we had best give hypodermatic injections over the *mons veneris*. The patient's strength, also, must be sustained by quinine, wine, analeptics, nourishing, and readily digested food.

We will here describe two conditions which occur as sequellæ to the anomalies already described. These are hypertrophy and atrophy of the female bladder.

Hypertrophy occurs with all the displacements (cystocele, etc.,) when they are of long duration, with new growths both of urethra and of bladder, and with inflammatory processes of the vesical neck. The thickening may affect all the coats, or only the muscularis totally or in part. If only certain portions of the muscularis are hypertrophied, the mucous membrane may be forced in between the muscle bundles, and, distending the peritoneum, form diverticula of the bladder. This happens, however, much more rarely than in the male.

Most often, however, hypertrophy is caused by some hindrance to the outflow of urine and leads to dilatation of the bladder, which in the female may attain very considerable dimensions. Thus in the case that I have already mentioned, the diameter of the bladder was 10.5 inches; its walls were .6 inch thick. Schatz describes a case in which the organ was over 6 inches in length and breadth.

Diagnosis.—If the bladder is much dilated, we will be able to feel it above the symphysis, even after emptying it with the catheter as a hard tumor. Its boundaries may be determined by percussion, and the sensitiveness of its walls by the catheter; and the examination of the urine will reveal the composition of its inner surface. We will almost invariably find the hypertrophy to be not simple, but complicated with some other condition.

To cure the malady we must attack its causes. All hindrances to the free evacuation of urine must be removed. If in spite of this, urination is still difficult, the catheter must be regularly used and the expulsive effort saved as much as possible by means of external pressure applied at the time. The use of a good ceinture hypogastrique is of service, as are also cold compresses, the cold douche applied to the lumbar region, cold vaginal injections, cold sitz or sea-baths. Of course any complications which are present, as catarrh, displacement, (cystocele), etc., must be simultaneously treated. The method of vesical irrigation which we have already described, enables us admirably to compensate for irregularities of contraction of the hypertrophied bladder, by means of variations in height of the funnel.

For irritability of the vesical neck we may use narcotics locally in the form of vaginal suppositories, bougies and vesical injections.

Atrophy of the female bladder may occur in consequence of very great distension and dilatation, but happens more frequently from that condition of paralysis of the muscularis which we shall describe more fully under the head of neuroses of the bladder in Chapter XVI. Occasionally it is seen with a hypertrophied muscular coat, as in one of our own cases; and in old women it may occur without any paralytic condition being present, the vesical walls being sometimes almost as thin as paper. All three coats seem to participate in the atrophy, and I believe that it is a cause of the frequent occurrence of cystocele in advanced life. This latter condition is of course only to be treated by mechanical means of retention or by anterior colporraphy. If disturbances of micturition still persist, the use of local stimulants, cold douches, catheterism, and the induced current are indicated.

Chronic Vesical Catarrh in an old Woman. Rapid Dilatation of the Urethra; Illumination of the Inner Surface of the Bladder with Rutenberg's Apparatus; Great Mobility of Mucosa upon Muscularis. Washing of Bladder twice Daily with Salicylic Acid Solutions. Cure in 8 Days.

A woman 60 years old, large sized and of strong frame, entered my gynecological division July 6th, 1876. Since her last pregnancy, 20 years before, she had not menstruated. Four weeks ago she underwent severe bodily exercise, and began to have pains in the vesical region, especially before and after micturition. The epi- and hypogastric regions were very tender, the vagina was narrow and in condition of senile atrophy; the posterior bladder-wall was very sensitive to the touch; the urine was pale and muddy, and contained a little albumen. A chronic cystitis was diagnosed. The urethra was dilated under chloroform, and to my astonishment I found that a pale bluish-red portion of the mucous membrane forced itself into the lumen of the largest speculum, making me believe there was a vesical polypus. But I could feel none when examining with the finger, though I recognized then that the entire mucosa was loosened and movable upon the muscularis. No polypus were visible when the bladder was dilated with air and illuminated. There were only the appearances of chronic hyperæmia, moderate redness, swelling of the mucosa and ready bleeding of the inner vesical surface when injured. Injections of salicylic acid 1:600 were ordered twice daily, and tra. quinine and later decoct. colombo with tra. thebaica internally for her diarrhœa. The urethral dilation, though done strictly according to Simon's rules, did cause a moderate-sized bleeding fissure at the base of the clitoris. The urine was drawn by catheter for the first two days. There was no other reaction. The temperature was never over 99.3° F., nor the pulse above 68 to 84. The burning after injecting lasted about one hour, and then the patient felt better. The urine cleared, and on July 15th the patient was discharged cured.

The peculiar loosening of the mucous membrane, which might have become inverted through the urethra, and the slight amount of reaction in spite of the patient's age render the case especially interesting.

CHAPTER XV.

FOREIGN BODIES IN THE FEMALE BLADDER.

WE divide all foreign bodies which may be found in the female bladder into those that originate in the organ itself, those that come from other parts of the body, and those that are introduced from without.

1. We have already mentioned a large number of the foreign bodies which gradually obtain access to the bladder on page 154, when discussing perforation of that organ. We have mentioned perforation by inflamed cystomata of the ovary, by the products of extra-uterine pregnancy, from exulcerated portions of the intestine and from the gall-bladder. There remains to be mentioned penetration by echinococcus vesicles Cases of this nature have been recorded recently by S. Eldridge,[1] and in earlier times by Laennec, Parmentier, Vigla, Fleckles, Weitenkampf and Freund-Chadwick. The latter has given us an excellent representation of the condition of things in his patient, which I reproduce here.

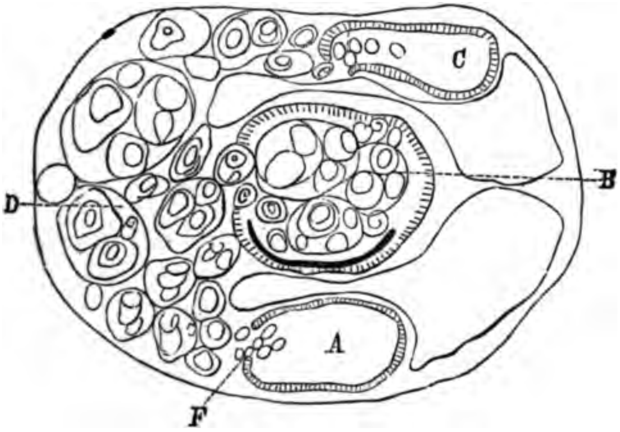

FIG. 63.

A is the bladder, B the uterus, C the rectum. The echinococcus is located in the posterior uterine wall, and thence has penetrated bladder and rectum. At F and *e* respectively, the bladder and rectum have been penetrated.

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[1] Echinococci in the female bladder; cystitis; excessive dilatation of the urethra; cure. Amer. Journ. of Obstetrics, New York, 1881, XIV., 106–108.

Such an invasion of the bladder is accompanied by the usual signs of vesical irritation and by the subsequent passage of perhaps large numbers of pea- to walnut-sized vesicles in the urine. The diagnosis is therefore not difficult. The passage of vesicles may occur periodically for years, the patient in the meantime remaining fairly well. (See Vigla's case.) Several cases of this kind have got well under the alkaline Carlsbad waters. (Parmentier, Weitenkampf, Fleckles.) The echinococci may reach the bladder from the pelvic connective tissue, from the pelvic bones, from the utero-vesical interspace, or from the kidneys through the ureters.

The other parasites which may be present in the bladder are the distoma hæmatobium, which Bilharz has described, and Lewis's filaria sanguinus hominus, which causes the tropical chyluria. It is not improbable that the filaria which I found in the ascitic fluid of a lady who had formerly long resided in Surinam, might penetrate the bladder, although I found none in her urine.

Küssner found leptothrix upon the inner surface of the bladder of a diabetic, who had never before been catheterized, and whose water was drawn with a clean instrument.

From the pelvis of the kidney come renal calculi and fragments of renal substance, which have been detached by a suppurative nephritis. Taylor found such a fragment in a boy of eleven years, who had nephritis abscedens after scarlatina, and I, with Professor F. E. Schulze and Dr. Werdner, found another in a puerperal woman with high fever, who, however, recovered.

2. Foreign bodies coming from without may reach the female bladder in four various ways. They may be forced into the bladder through the urethra or the vagina by a fall upon certain objects; or the patient, suffering from retention, may attempt to catheterize herself and either break the instrument or let it slip out of her hand; or a pregnant woman may attempt to bring about abortion by introducing something into the genitals, or, probably most frequently during attempts at masturbation, the objects used slip into the bladder. The foreign bodies are very various. Odone found a piece of wood, Jobert de Lamballe a lead pencil, Dupuy a wisp of straw in the bladder as the result of a fall. In consequence of careless catherization a patient of Thomas Haigh Martin allowed the stem of a tobacco pipe, which she used for that purpose, to glide into the bladder, while one of Leonard's permitted a goosequill, and still another the blunt end of a catheter to disappear in the same way. To produce abortion Zechmeister's patient thrust a splinter of wood 2½ inches long into her genitals, while Nélaton's pushed one of about the same size into the bladder. The number of articles which have been used by women for purposes of onanism are extremely various. In 258 of intentional introduction into the bladder for this purpose, reported by Denucé, 119 were

in men and 96 in women; and among them 5 girls under 14 years of age. Pins, hairpins, sewing and knitting needles were introduced 82 times; needle-boxes 15 times (cases of Dupuy, Dieulafoy, Fleury and others); and toothpicks, iron wire, ivory nail-cleaners and many other objects.

A gradual entry of foreign bodies from the vagina, as occurs from the perforation of pessaries, we have already considered under vesico-vaginal fistula, (page 101.)

As to the symptoms of these vesical ingesta, they may be said to be frequent urination, hæmaturia, and strangury. Gradually the foreign bodies become encrusted with salts, and cause vesical catarrh, ulcerations, and perforation of the bladder-wall. Occasionally, if they are not too large and are not impacted in the wall of the viscus, they may be spontaneously evacuated; this occurred 31 times in Denucé's 440 cases. If the vesico-vaginal wall is pierced, the foreign body, if not too much encrusted with salts, may pass off per vaginam, often leaving behind a large vesico-vaginal fistula. If the foreign body is not removed it may exhaust the patient by reason of the pain it causes, and the vesical catarrh it sets up; and abscess, phlebitis, gangrene of the bladder-wall and death of the patient may occur.

The treatment of this class of cases has been much simplified since we have learned the distensibility of the female urethra. Besides Simon's specula and forceps, we need only a pair of toothed forceps. As soon as we have recognized with the metallic catheter the existence of a foreign body in the bladder, we anæsthetize the patient, dilate the urethra according to rule, find the foreign body with the finger and fix its lower end, and, passing a pair of forceps in alongside, seize and extract it. In October, 1881, I extracted in a few minutes in this way the ivory handle (2.8 inches long) of a crochet needle. Complicated apparatuses, like those of Bianchetti, are no longer necessary; we can introduce in a very short time instruments .8 inch in diameter, while his tubes are only 3 to 4 lines across. If there is any difficulty in getting the end of the object which the forceps has seized into the urethra, a finger in the vagina will assist in turning its long axis parallel to that of the canal. Or the largest sized speculum may be pressed against the body, which is seized by the forceps passed through the speculum, and the forceps gradually worked to the lower end of the foreign body. If the body in the bladder is difficult to seize, it is often useful to fill it with lukewarm salicylated water and then extract. If the object is barbed, like a crochet needle, Denucé recommends forcing it through into the vagina; the resulting fistula soon heals spontaneously. If the foreign body is impacted in the vesical walls, or is very large, we may endeavor to dislodge it or diminish its size with Hourteloup's or Civiale's lithotrite. Thus, Henry Smith had to break a bone nail-cleaner into pieces in this way before he could get it out. If the body has pierced the vesical wall, and if the portion in the bladder has become so encrusted with salts that it cannot be withdrawn through the original opening, we must enlarge it with a blunt-pointed bistoury, as Jobert de Lamballe had to do with a lead pencil and Mytterhoeven with a pessary.

If extraction is not possible in this manner, cystotomy is indicated. Nevertheless we must not too readily have recourse to it; it is more dangerous than the former plan, which has often succeeded after days and weeks. Where cystotomy is really necessary, it should be done in adults by vesico-vaginal incision (see page 15) whenever it is possible; in very young girls it will be necessary to do the suprapubic operation. The prognosis of the two operations is very different. According to Denucé in 34 cystotomies done in females for the extraction of foreign bodies, 22 were done by the vaginal method, and 12 by suprapubic incision; of the former 15 or 70 per cent. got well, of the latter 2 or hardly 17 per cent. The after-treatment is that described for vesico-vaginal fistula, pages 114 and 134.)

3. *Vesical Calculus in Women.*—Podrazky has thoroughly discussed the subject of lithiasis in the 3d volume of this work, and we will simply recapitulate briefly what he has said, adding whatever has been done in the 13 years since his monograph was written.

Etiology.—Vesical calculi are formed upon all bodies that reach the bladder cavity from without, or from within the body, or upon prominences of the vesicular wall (comp. page 167), or finally they arise from the spontaneous precipitation of the urinary salts. They may occur at any age, but are found most frequently in childhood. They are much less common in the female than in the male, from the shortness of their urethra and the consequent rarity of stricture and facility for the cure of vesical catarrh. Dr. Klein found in the Moscow city hospital from 1822 to 1860, among 1792 cases of vesical calculi, only 4 occurring in females. The lithotomist of Upper Swabia, Michael Lett, in his practice of 57 years, did 106 lithotomies in men, and only one in a woman. I have examined about 10,000 women and girls in Berlin, Rostock, Dresden and Munich from 1860 to 1884, and, save in the case already recorded under No. 15, I have only once found a calculus, and this was small and easily extracted per urethram. Among the 3500 autopsies done upon women at the Dresden city hospital, stone in the bladder was found 6 times. Walter Coulson calculates that for 100 cases in males there occur 5 in females. Even in childhood there is a marked difference between the sexes. Giraldès says that vesical calculus occurs 24 times more frequently in boys than in girls.

We not infrequently find urates in large quantity in the bladder of the newborn, and uric-acid infarctions in the kidneys of stillborn infants. Vesical calculus may also occur. In England, Russia, Persia and Egypt, stone in the bladder is especially frequent.[1]

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[1] Bilharz: Distoma hæmatobium.

The shape, size, number, and composition of these calculi in women vary greatly. We find uric acid, phosphoric acid, oxalic acid, and cystin calculi, and combinations of them. The rarest of all are those composed of cystin, they being 3 per cent. of all.

The seat of stone in women is usually in the deepest portion of the bladder, in the fundus behind the trigonum. In one case, at the autopsy of a patient sixty-seven years old, at the Dresden hospital, I found a calculus the size of a walnut lodged in a pocket of the bladder, above and behind the retroverted fundus uteri. The vesical neck was attached to the rectum by firm adhesions which forced the uterus backwards, fixing the upper part of the bladder as in retroflexio uteri gravidi, and in this curious place was lodged the stone. If the calculi are numerous and large, the bladder sinks with them, and a cystocele is produced (comp. page 83), as in the cases recorded by Rossel, Tolet, Moreau, Ruysch, and others, in which there were from 11 to 55 stones. On the other hand, a neglected cystocele may cause vesical catarrh, and so lead to the formation of stone.

In my case the calculus was lodged at one side behind the horizontal ramus of the pubis, so that it felt at first like an exostosis attached to that bone. Stones may also form in diverticula of the bladder, or may lodge in them after formation. Thus, in one of our Dresden city hospital post-mortems (No. 10, v. 20, I., 1858) in a woman sixty-four years old, there was a sacculated diverticulum in the posterior wall which only communicated by a very small opening with the general vesical cavity. In it was a hard, sharp-edged, cherry-stone-sized calculus. The case recorded by Cadge also belongs here.

The size of these calculi varies from that of a grain of corn to that of a child's head. Hugenberger extracted one weighing 3¼ ounces and measuring 6 × 5.4 inches in 1871 by colpocystotomy; while Wendel records the passage of one per vaginam through a vesico-vaginal fistula in a woman sixty-two years old, the size of an apple.

The number of calculi may be very great. Rosset found 11, Ruysch 45. P. Adam saw 90 evacuated spontaneously. The cases of Josephi (page 154) and Löwenson (page 180) show that hundreds of stones may be present in the female bladder.

Symptoms of Vesical Calculi.—These depend upon the causes, shape, surface, size, and number of the stones, and upon the complications. Those calculi due to perforation of the bladder by ovarian cystomata, fœtal sacs, etc., are preceded by symptoms of threatened cystitis with peritonitis for a long time. On the other hand, calculi which have originated inside the bladder, especially when round, small, and smooth, may exist for years without the bearer suspecting their presence. In the Dresden

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[1] Nouvelles observations sur la pratique der accoucher, Paris, 1714, LVI., p. 297.

city hospital in 1876, a patient was admitted after whose death 185 calculi were found in the bladder, without his having had any trouble during life.

But if the stone is of rapid formation, if it is heavy and rough, hyperæmia of the mucous membrane, hypersecretion, catarrh, or inflammation leading to perforating abscess will soon result. Vesico-vaginal fistula is not infrequently caused in this way, Bouqué finding it 6 times in 204 fistulæ. Before perforation occurs there will be dysuria, strangury, ischuria, incontinence, and sudden interruption of the urinary flow; impaction of calculi in the urethra and then spontaneous expulsion, are not only commoner in women than in men, but occur with much larger stones also. Such cases have been recorded in great numbers, most recently by Scanzoni, Hyrtl, Josephi, B. S. Schultze, Cohn, (see Hugenberger), Adam, Villebrun, etc. Thomas Bryant has collected in English alone the records of 13 cases of spontaneous expulsion, in some of which the stone was 6 inches in circumference and weighed 4 ounces. The seat of the pain, as long as the calculus still remains in the bladder, is various; sometimes it is above the symphysis, sometimes radiating to urethra and vagina, sometimes in the legs, the back, the loins, and even the upper extremities. In my case, when the finger was introduced into the vagina, there occurred a spasmodic contraction of the levator ani so severe, that I could hardly move the finger about at all; and touching the cherry-sized stone from the vagina was extremely painful. Hæmaturia, sometimes of considerable amount, may also occur. Since calculi occur at all ages, they may be a serious complication in pregnancy, confinement and the puerperium. Hugenberger (see above) has investigated this subject very thoroughly, and has 23 cases of vesical calculus in women during the childbearing period, recorded from the 17th century to 1875. There are first 4 cases of De la Motte, Deschamps, Velpeau and Henry Thomas (*Lancet*, 1839, Vol. I., No. 21), who all relieved their patients by operations performed while gravid. Thomas's case is of some interest. At the 4th month he removed, by Lisfranc's vestibular incision, a stone 1½ inches long, 1 inch thick, and weighing 6 drachms. The wound healed entirely in 32 days, and at the 7th month the woman gave birth to a macerated child. The 5th case is one of Hugenberger and Heppner, where vesico-vaginal incision was done at the 8th month of pregnancy. Pyæmia occurred after the sutures were removed, premature labor set in on the 23d day, and death followed on the 39th day.

Seven of the 23 cases did have spontaneous delivery; but some of them were badly injured in the process.

1. Guillemeau. Reposition of the stone, which fell back again; contusion of the bladder-wall and perforation. 2. Smellie; the head drove the goose-egg sized stone down before it, and both were delivered. Consequence, incurable incontinence. 3. Lowdell extracted a stone which had caused a vesico-vaginal fistula during delivery. Baker Brown found a

vesico-vaginal fistula caused by a stone, extracted one 2 inches long, 1 inch broad and 3½ inches in circumference through the dilated uretha, and cured the fistula afterwards. 5. Henry Jackson removed by urethral incision a round stone 4½ inches in circumference, which was impacted in the urethra, and prevented delivery. 6. Cohn was about to do a Cæsarean section on account of pelvic exostosis, when the woman was suddenly confined spontaneously, and a day later spontaneously passed a calculus 1¾ inches in length, ¾ inch broad, and ¼ inch thick. 7. L. Bourgeois extracted a stone from the bladder of a woman who had been naturally confined 3 months before.

Eight times obstetric operations were rendered necessary, because of calculi, in the cases of Willoughby, Arnaud (extraction with the hand), P. Dubois, Richard, Nægeli (forceps), and Erichsen (perforation).

Operations for stone were done 8 times during labor, by La Gouche, Levret (extraction), Denman, Monod (vesico-vaginal iucision). Monod has twice done the vesico-vaginal incision in pregnant women, in 1849 in a primipara forty years old, and in 1857 in a primipara twenty-four years old. In the latter case reposition did not succeed, and delivery was accomplished with the forceps after the stone had been removed. The fistula healed spontaneously in 20 days.

The successful reposition of a stone *inter partum*, has occurred but once, and by P. Dubois.

We may add here a case of Sainclair's in which a gravid woman with large vesical calculus and suffering from pain, fever, incontinence and cystitis, had a premature delivery. Three months later she spontaneously expelled a stone of mixed phosphates, oxalates, and urates 2.8 inches long, 1.2 thick, and 1.6 broad. The calculus passed out through a large vesico-vaginal fistula, which was cured later.

Thus there have been recorded until now 29 cases of vesical calculi in pregnant women, and in all there has been a more or less serious interference with the reproductive process.

Diagnosis.—One would not think that it would be difficult with the vaginal touch and the vesical catheter to recognize the existence of a calculus in a female. Yet mistakes have occurred from forgetfulness to thoroughly examine the bladder. The unusual body which was felt has been taken for a pelvic exostosis (cases of Sainclair and of Cohn), or for an ovarian tumor if it is situated to one side (Threlfall's case), or as a tumor springing from the symphysis (case of P. Dubois). Besides, echinococci have been found located between bladder and uterus (case of Birnbaum), which might be another source of error. If we feel per vaginam a tumor through the anterior vaginal wall, we should never omit to pass a metallic catheter, and, fixing the stone from the vagina, endeavor to get the peculiar sound and feeling of a calculus. William Donald Napier has given us a sound which gives us ocular demonstration of the presence of calculi; it is described on page 21. Before introducing it we must examine the point with a magnifying glass, to make sure that there are no marks upon it. If there still remains doubt, urethral dilatation and direct palpation of the internal surface of the bladder will almost always give us a certainty. At the same time we can recognize the seat, size, and surface of the stone, though this can be done fairly well from the vagina. In every respect the diagnosis is easier than it is in the male. Sometimes the first symptom which leads us to examine for stone, is the passage of one or more concretions spontaneously. In a cystocele we may be able to feel the stones in the tumor, which is visible between the labia minora. (Norreen's case.)

If after a successful operation for vesico-vaginal fistula, there set in symptoms of vesical catarrh, or hæmaturia, or dysuria, we may suspect that fragments of sutures or vesical pockets have caused the formation of a stone, and we must carefully examine the bladder with catheter and finger.

Finally, we must decide whether one or several calculi are present, whether they are free or fixed (see Heath's case in 1871 in a girl 11 years old), or whether they are in a depression (compare Sentin's case page 154), which perhaps leads to a canal communicating with the ovary or a fœtal sac, or whether they are in a diverticulum. We will, therefore, fill the bladder with lukewarm salicylated water, and then attempt to displace the stone from the vagina or with the catheter. If this is not sufficient, we will dilate the urethra, and examine the stone with finger and sound.

Prognosis.—The smaller and softer the stone, and the earlier its presence is recognized, the better the prognosis. Calculi .8 of an inch in diameter are the largest that can pass through the urethra without subsequent incontinence. Soft calculi are always more favorable, since their size can easily be diminished. Those over 1.2 inch in diameter and not suitable for lithotrity are more serious, since they necessitate vesico-vaginal incision. In very young girls the prognosis is less favorable from the smallness of the parts; but in a general way the prognosis of stone in the bladder is far more favorable in women than in men, and has been much improved recently by the introduction of Simon's rational method of urethral dilatation. And in addition, small fragments left in the bladder after operation are far less likely to cause a new formation of stone in women than in men, since they are much more likely to be passed spontaneously.

Nevertheless, neglected calculi in the female may cause severe suffering, exhausting hemorrhages, fistulæ, and death. This is sufficiently proven by numerous cases, among others by those of Fabricius Hildanus, Conradi, Denman, Fox, and Denaux. Cure is often slow, and spontaneous evacuation through a non-dilated urethra may cause incurable incontinence, as is seen in the cases of Garden, Howship, Nankiwell, Mendel, and many others. The general health may suffer severely from the urinary trouble and the hæmaturia. Pregnancy may be interfered with. Walsham found that among 55 girls under fifteen years of age, who had stone, 3 died after operative procedures, and 52 were cured; but of these 52, 9 had permanent and 3 temporary incontinence afterwards. Thus 23 per cent. of all were left with an incurable and often fatal trouble. (Comp. pages 107 and 112.) This frequent occurrence of incontinence is to be explained by the use of unsuitable instruments, of dilators such as those of Weiss, which do not dilate evenly, and by the fact that we have only recently learned the limits to which dilatation can be pushed without fear of incontinence. And since we now know how to lessen the calibre of the urethral canal by operation, the prognosis has become much better. But the malady is not an unimportant one, and we should be chary in giving a good prognosis.

In conclusion it is of great interest to note that the vaginal incision for the extraction of foreign bodies from the bladder often closes spontaneously without further treatment. Bouqué cites the cases of France (1808), Clémot (1817), Cittadini (1826), Bellini (1827), Grillo (1827), Rigal and Blandin (1830), Tommaso (1836), Rossini (1847), Marzuttini (1862), de Luca (1863), Montini (1863), Burci (1866), and Denaux (1872), where this occurred. Such a record speaks strongly for the vesico-vaginal operation.

Therapy.—There is but one indication as soon as a calculus is recognized in the bladder, and that is, to remove it as speedily as possible. But the physician should prevent the formation of stone. This is to be done by the careful treatment of hyperæmias and vesical catarrhs, by the reposition of displacements of the viscus, by remedies directed against kidney trouble and gall stones, and by frequent washings of the bladder where there has occurred perforation from a neighboring organ. It has been proposed, where decomposition of the urine is occurring, to use carbolized injections, and thus form the carbolate of ammonia. But we know that we cannot expect to accomplish anything by the injection of substances to dissolve the stone, as Millot has proposed to do by means of gastric fluid, or by electrolytic methods.

The following are the methods for the removal of vesical calculi from the female bladder: 1. Urethral dilatation, and extraction with forceps. 2. Lithotrity or litholapaxy. 3. Vesico-vaginal incision. 4. Vestibular incision. 5. The lateral incision; and 6, the suprapubic incision.

1. The operation of urethral dilatation in women, for the extraction of stone is, as has been mentioned before, an old one. Benevieni recommended it in 1502, Marianus Sanctus described it in 1526, Peter Franco in 1561 proposed a special instrument for its accomplishment, and Alpin relates that in 1591[1] an Arabian whom he knew, named Haly, dilated

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[1] Prosper Alpinus de Medicina Ægyptiaca, lib. 3, cap. 14.

the female urethra by means of tubes of increasing diameter, which were inflated with air. Later Solinger (1698), Douglas, Bertrandini (1769), attempted to dilate the urethra in the course of 7 to 8 days by means of tents formed of sponge covered with parchment. Bromfield used the processus vermiformis of a small animal, which he introduced with a sound, filled with water and tied. Thomas (1815) dilated with compressed sponge, as did Astley Cooper, John Wright, and others. Instrumental dilators were described by Peter Franco[1] (in 1666), his instrument being like an aural speculum, while Fabricius Hildanus (1628) has one which is like the old four-leaved specula. Mazzoti (Florence, 1770) proposed a tricuspid dilator. But all these instruments are long since obsolete. In England, however, there is still much in use an instrument made by Weiss of London, after Astley Cooper's model. It consists of two leaves, each like one half of a metallic catheter, and separated from each other by a screw. It is not only useless, but may do injury, thus causing in Brodie's case incontinence, which lasted fourteen days. Rapid dilatation may be done even in children under fifteen years of age. In 7 cases it has been done in children successfully; by Curling, Heath, Hillmann, Gwinne, Davey, Lolly, and Wakley (cf. Walsham); and the incontinence which twice occurred is to be ascribed to improper methods, such as dilatation with the finger, or with a pair of forceps. In 15 cases of gradual dilatation there was failure to extract the stone in one only, the child dying of kidney disease; all the others recovered without incontinence. On the other hand, dilatation with incision, or incision alone as practised by the English surgeons, has proved to be dangerous; in 17 cases 7 had subsequent incontinence. There is no danger of this if Simon's method be carefully carried out.

2. Lithotrity or litholapaxy is indicated in the female when the stone is over 1 inch in diameter, or when it is composed of salts deposited upon some foreign body. Fergusson gives a list of cases in which he has done lithotrity in girls with most brilliant results, nearly always removing all the fragments at the first sitting. And Walsham has collected altogether eight cases of lithotrity in girls under fifteen years of age, with and without previous urethral dilatation, in all of which there was complete cure without incontinence. In three of these latter cases repeated operations were necessary on account of the size of the fragments. The patients are narcotized and put in the lithotomy position. Then the bladder is filled with three to five ounces of lukewarm water, the instrument is warmed, greased with carbolized oil. The stone is then guided from the vagina in adults, from the rectum in children, into the jaws of the instrument, and is broken. After this more water is injected into the bladder, the smallest of Simon's specula introduced, and as many calculi as possible

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[1] De la cure de la pierre aux femmes. Lyon, 1561, p. 143.

removed. Then search should be made for larger fragments which may have remained behind per vaginam, and the urethra dilated still further, or lithotrity repeated. The after-treatment is that of vesical catarrh.

3. The vesico-vaginal incision is to be employed when the stone is over 1-2 inch in size, and is too hard to be crushed. Fabricius Hildanus (1628) was the first to do it. It was long the practise when the calculus was lodged in a cystocele, to incise the sac for the removal of the stone; this has been done by Rosset, and by Ruysch. Or a hollow sound was passed into the bladder, the point pressed against the vesico-vaginal septum, and the cut made down upon the groove. The description of Simon's T-incision, which is only needed with very large stones, is given on page 15. Walsham states that by means of the vesico-vaginal incision 6 out of 8 children were completely cured; 2 remained incontinent from laceration of the soft parts and the urethra in extraction. The vesico-vaginal incision is in the female by far the best operation for the extraction of calculi. According to Aveling there was only 1 death in 34 operations of this kind. But in children the calculus may be so large that it cannot pass through the lesser pelvis, or can only be dragged through with much laceration of the soft parts; and this may even be the case in adults, as in Josephi's cases of extra-uterine pregnancy with penetration of the bladder.

4. The vestibular incision. We mentioned in the introduction the Celsian operation for stone in women, and saw how indefinite his description was; since we cannot understand what he means by "sed virgini sub ima sinisteriora." The statement "mulieri vero inter urinæ iter et os pubis incidendum est" is clearer, and evidently means something like the operation which Lisfranc proposed in 1823, but did not do upon the living subject. He proposed that an assistant should press down the point of a male catheter, which had been introduced into the bladder with its convexity upwards, while another assistant forcibly separates the labia minora. Then the operator cuts with a straight bistoury, beginning above the urethra, and going from right to left, dividing mucous membrane, connective tissue, and the constrictor cunni. Under the symphysis, without injuring the pudendal artery, whose pulsations can be plainly felt, he enters the anterior vesical wall, and cuts it longitudinally or transversely. But the space obtained to work in is smaller, and the hemorrhage more serious than in other methods. However, as we mentioned on page 194, Thomas in 1839 successfully removed a stone from a pregnant woman by this method.

5. Lateral lithotomy in the female is done either in the method of Celsus before mentioned, or as done by Frère Jacques de Beaulieu from the left tuber ischii, against a gorget introduced into the bladder, or in the manner more recently (1854) proposed by Buchanan of Glasgow. He has an assistant hold a hollow sound introduced into the bladder, and near

the clitoris begins an oblique cut through the left labium minus parallel to the left pubic ramus. As soon as he can feel the gutter of the sound he transfixes the vesical wall against it with a straight bistoury; he then enlarges the vesical wound above and below without injuring the vagina, until he can pass his finger into the bladder. He operated in this way upon four children from four to seven years old, and quickly removed stones varying from 15 to 75 grains in weight, and without incontinence. Finally, the method by which the urethra and vesical neck is split to the left side of the vagina, along a channelled sound, has been called lateral lithotomy. During the operation an assistant fixes the left labium with one hand, while another pulls the vagina to the right, and protects it from injury. The operation may also be done with the lithotome caché; and v. Nussbaum (1861) did it repeatedly and with success before lithtrity.

6. Supra pubic lithotomy, epicystotomy, sectio alta, is only indicated in the female when the size of the calculus or the number of the stones, or the narrowness of the soft parts, renders the vesico-vaginal incision inadequate. In 4 cases, done on girls 4 to 8 years old, 2 ended in death, and 2 in recovery. The method of operation is exactly the same as in the male, and its description here is unnecessary.

In any operation where an artificial opening is made into the bladder, if it is not to be immediately closed with metallic sutures as in vesico-vaginal and urethro-vaginal fistulæ, a catheter should be placed within the urethra so as to promote the outflow of urine along the natural passages. Still, it is not invariably necessary, and sometimes does harm; and if urine can be passed spontaneously, it is only to be used for washing out the bladder and removing blood clots.

CHAPTER XVI.

NEUROSES OF THE FEMALE BLADDER.

Cystospasmus and Cystoplegia.

THOSE affections of the bladder which occur without disease of its texture or change in its contents, and which, therefore, must be affections of its nervous apparatus, we call neuroses. They consist of vesical spasm, and vesical paresis and paralysis. In many, even in most of these cases, there is in addition some local disease of the tissues, and the neurotic disturbance is but a symptom. There is no doubt that the more we make use of urethral dilation as a method of examination, the more cases of what we used to call primary vesical neuroses do we recognize as secondary ones. Thus several writers have lately described fissure of the vesical neck as the cause of cystospasmus. We should be cautious, therefore, in diagnosing neuroses of the bladder, and should arrive at them only by process of exclusion.

1. *Vesical Spasm, Cystospasmus, Neuralgia Vesicæ.*—Causes are chiefly nervous. Very excitable women easily have spasm of the bladder. Strong mental emotions, onanism, violent coitus, cold, especially at the menstrual epoch, sitting upon the damp ground, wetting the feet; all these may cause it. The free use of various drinks, as of several kinds of beer, and of new sour wine, has induced it, probably from chemical action of the kidney secretion upon the sensitive nerves of the vesical mucous membrane, causing hyperæmia of the latter. Playfair found in a number of women during the latter months of pregnancy, a continual desire to urinate, even at night, with a cloudy urine, which resisted all manner of medicinal treatment. He believed that in these cases the fœtus was in faulty position, that its shoulder pressed against the mother's bladder; and he found that upon manually altering the position the disorder vanished. As a secondary affection neuralgia of the bladder occurs in almost all the diseases of the bladder which we have described.

Symptoms.—The first and most important symptom of cystospasmus is the frequent occurrence of cramping pains and pressure in the vesical region, and especially at the vesical neck. When the bladder is full there is moderate tenderness; and the pain is worst at the beginning of the act of urination, which may be repeatedly unsuccessfully attempted or avoided fear. The urine is pale, non-albuminous, contains no sugar, pus, blood, urates, or foreign bodies. There may be large quantities of it, though only passed in drops. Occasionally the passage of a metallic catheter through the urethra and into the vesical neck is dreadfully painful. Twelve years ago, before we were acquainted with the method of rapid urethral dilatation, I endeavored for months to relieve an affection of this kind in a moderately stout patient; relieved for a time, it always returned, until finally she left me, I suppose cured. I now believe that she had erosions or fissures, and that the remedies which I applied in the form of bougies to the urethra and the vesicollum, did no permanent good, because they did not act long enough. I once had an opportunity to convince myself at the autopsy of a puerpera who had suffered from ischuria and intense pain on catheterization, that at the neck of the bladder there was an ulcer the size of a pea. She had died of septic peritonitis. Here also the cystospasmus was only secondary. The pains sometimes radiate in all directions, and cause excitement, fear, cold sweat, nausea, anorexia, and sleeplessness. If they persist, they may exhaust the patient and actually cause melancholia. Marion Sims (Clinic of Uterine Surgery, p. 248, 1864) has pointed out that abnormal irritability of the bladder occurs with vaginismus; and it is well possible that the cystospasmus is here due to extension through the upper part of the hymen into the urethra and the vesical neck. The attempt to pass a catheter upon one of these patients causes symptoms analogous to those of vaginismus.

Diagnosis.—If the urine is normal, the urethra healthy; if there are no abnormalities detectable in the blood supply or texture of any part of the vesical wall when examined with the finger and with the eye; if after specular dilatation of the urethra the anterior vesical wall has been examined with Rutenberg's speculum and found normal; then and then only can we diagnose a primary spasm of the bladder. For not one of the above-mentioned symptoms is pathognomonic.

Prognosis.—Spasm of the bladder may last for months and years, and though not dangerous, is exceedingly troublesome. If not of too long standing the prognosis is fair; and even in the worst cases it can usually be cured in time.

Therapy.—If possible, remove the causes; excise the hymen in vaginismus, forbid sexual intercourse, order hot foot baths, stop the use of wine, beer, and tea, and seek to allay vesical irritability by the use of almond milk, one wineglassful three times daily.

At the beginning local opiates will render us most service; and it is best to give at once a ⅙th grain morphine injection in the skin of the vesical region. Less rapid but as sure are suppositories containing ⅙th grain of morphine or ⅓ grain of extr. of belladonna to 40 grains of cocoa butter. Internally we may use almond emulsion with extract. hyoscyami, 24 grains to ℥ vi.; or opium with lupulin (3 to 5 grains) several times daily; or extract. cannabis indicæ 2½ grains, or tinct. cannabis indicæ *gtt.* 10 to 15 t. d. Chloral hydrate is one of the most certain remedies that we possess, and it may be injected into the rectum with a syringe to the amount of 15 grains dissolved in half an ounce of water, or administered internally with syrup of orange peel.

If these means are not sufficient, we must carefully regulate the patient's diet and her evacuations. We must use warm baths, and prescribe the free use of carbonated waters such as Weldmeyer, Biliner, Vichy, soda water, etc. If the malady is still unrelieved we must undertake mechanical dilatation of the urethra. Hewetson (4, XII., 1875) recently cured a cystospasmus of 15 years' duration in this way, and the method has been highly recommended by many authorities, including Teale (*Lancet*, 27, XI., 1875) Tilloux (Virchow-Hirsch, Bericht für 1873, p. 184), Spiegelberg (see obid.), etc. Again we may try the introduction of broad soft pessaries into the vagina, so as to put a moderate pressure on the bladder. Finally we may employ injections of morphine into the bladder with subsequent cauterization, as done by Braxton-Hicks (page 185) to relieve the reflex vesical irritability. Debout recommended bromide of potassium internally and also by rectal suppository in combination with tra. opii and ext. belladonna. As a last resort we may try the direct application of cocaine to the mucous membrane of the bladder.

2. *Weakness and Paralysis of the Bladder.—Paresis et Paralysis vesicæ.—Ischuria, Incontinentia, Enuresis.*—The physiologists are not agreed as to the exact functions of the two sphincters of the bladder, the internal one of smooth muscular fibres, and the external one of striped muscle. Some, like Budge and Hertzka, deny the efficacy of the external one, holding its function to be merely to assist in the evacuation of urine; while others, like Dittel and Kupressow, hold that the transverse internal muscular fibres of the vesical neck, like the similar fibres found in the urethra, have for their function the closing of the bladder. From a clinical standpoint, we must agree in the main with the latter opinion, especially after our experience with fistulæ of the vesical neck, which may reach to within ⅜th of an inch from the orifice of the urethra, and still afford continence after operation. However that may be, all authorities are to-day agreed that the evacuation of urine is a reflex act. The spinal and cerebral centres of the vesical motor nerves are excited to action, either from the vesical mucous membrane where there is a large collection of urine, or from a drop of urine passing the involuntary internal sphincter, and getting into the urethra, or from an effort of the will. On the other hand the will is able to resist the reflex action of urination by contraction of the external sphincter or compressor urethræ, as Hertzka calls it.

Causes.—Weakness and paralysis of the bladder in women may be due to central or to peripheral causes. The peripheral momenta have been described in the foregoing chapters, and are mostly of a mechanical nature, as from the vesical displacements, so often caused by pregnanc and child-bearing; but especially is it due to that *post-partum* bending o the urethra which we have spoken of before, causing retention, and afterwards weakening of the detrusor vesicæ, paresis vesicæ. Pressure of quit another kind may, however, cause exactly the same condition. An interstitial œdema occurs with ulcers of the cervix, with parametritis an peritonitis, and disables the detrusor. This usually occurs in the late days of the puerperal period, and is generally very obstinate.

Paralysis of the bladder also occurs not infrequently from periphera causes in typhus, and in dysentery, due to fatty degeneration of the muscular coats of the bladder.

In the same way paralysis of the bladder occurs in old women fro myopathic processes; and in young individuals acute paralysis of th bladder has set in from over-distension in consequence of excessive modesty.

The central and more general causes for vesical weakness and paralysis are cold, blows, falls, acute meningitis and encephalitis, myelitis of the lower part of the spinal cord, neuritis propagata from extension of inflammation from kidney and bladder to the plexus sacro-lumbalis (Kussmaul) large doses of opium, and finally, endarteris deformans of the pelvic vessels. Disturbance of consciousness in brain diseases (apoplexy), sopor, delirium, and high fever paralyze the detrusor, remove the influence of the will, and, overcoming the reflex contraction of the sphincter muscle, cause the urine to flow off involuntarily.

Symptoms.—The first sign of vesical weakness is increased difficulty in voiding urine. It becomes difficult to empty the bladder, the accessory abdominal muscles are put into requisition, and finally, the bladder can no longer be emptied, and retention of urine, ischuria, sets in. This may lead to enormous accumulations of water in the female. Liéven drew 128 ounces of clear transparent urine from the bladder of a woman thirty-three years old, in whom the distended organ formed a tumor as large as the uterus at six months, and who had been supposed to have an ovarian cyst. Others have emptied 16 beer-bottles full; Schatz, in the patient mentioned in page 178, drew 9 pounds of urine; and Hofmeier 4½ quarts from a bladder which was distended until it reached the navel. Budge showed the reason for this enormous distensibility of the viscus in a beautiful experiment. He cut the dorsal cord across, and proved that there ensued great vesical distension with increased reflex contraction of the sphincter vesicæ.

After the dilatation of the bladder has gone on to a certain extent, the resistance of the sphincter is usually overcome, and the urine partially flows off. The bladder is, however, not much diminished in size, and the condition known as ischuria paradoxa has set in.

If this condition lasts long, and if repeated introduction of the catheter becomes necessary, there soon arise vesical catarrhs, inflammations of the ureters, pyelitis, uræmic symptoms, and death. Or perhaps portions of the vesical wall begin to ulcerate, and perforation with peritonitis or fistulæ may occur. In very rare cases there occurs rupture of the bladder.

Incontinence of urine is a special form of vesical weakness, chiefly occurring in children. But it may persist after adolescence, and in one form, enuresis nocturna, sometimes remains after marriage. It is very apt to occur in scrofulous, cachectic, hysterical, delicate, pale individuals, and is sometimes more or less hereditary. In some cases it leads to serious catarrhal troubles, from the continuous wetting and catching cold, so that we may have in consequence inflammatory conditions of the bladder, rectum, lungs, and bronchi. Undoubtedly the non-efficient exercise of will power is of great importance in the causation of this affection; many authors explain enuresis nocturna by the absence of will control over the sphincters, which is the condition in deep sleep. If the incontinence lasts for a length of time, the muscular fibres are gradually weakened, and the involuntary evacuations may occur also during the day. Some authorities, and among them B. Erdmann, regard enuresis nocturna as an incomplete anæsthesia of the sensitive vesical nerves. The sensation caused by the filling of the bladder is present; but it is not strong enough to wake the child out of its ordinary sleep. Reflex evacuation then takes place.

Diagnosis of Vesical Weakness and Paralysis.—We must first decide in any case of difficulty in urination whether the bladder is filled and tense, and whether its walls are tender. This is to be ascertained by the physical examination of the lower abdomen, percussion of the vesical region, vaginal, or in very young girls rectal exploration. Then the urethral opening must be examined, the catheter introduced, and the strength and rapidity of the flow of urine observed. The inner vesical surface is then to be examined as to sensibility with the catheter. Then the urine is to be examined; and it must be decided whether the bladder is ever in a contracted state, and if so, how long it takes to fill up again. In enuresis infrequent urination is a sign of deficient action; too frequent action is a symptom of paralysis of the detrusor.

In pregnant and puerperal women, and in patients suffering from typhus and dysentery, the bladder should be constantly watched.

If we cannot find any local causes for the paresis, we must search for the rarer central ones. Active and mechanical incontinence has been differentiated (Hertzka) from the dribbling of urine which occurs in ischuria paradoxa or incontinentia paralytica. The latter is regarded as a symptom of vesical hyperæsthesia, while the former is considered as due to hindered extensibility of the bladder either from the enormous mass of its contents or from pressure of neighboring organs or tumors.

Vesical paresis from endarteritis occurs either in old people or in indi-

viduals in whom the premature calcification of the arterial coats will
easily recognized in the accessible radial, vesical, and uterine arteries.

Prognosis.—Paralyses and pareses due to local causes may usually
removed in a short time when the cause is remedied. But when they a
complicated with disease of the vesical wall, as occurs in chronic and n
glected cases, and especially when there is retroflexio uteri gravidi, they a
very obstinate and more serious. Vesical paresis from central or oth
causes, as apoplexy, meningitis, etc., increase the original trouble, ar
hasten death by the rapid formation of decubitus. The paralysis
typhus, dysentery, and peritonitis is not dangerous, and is usually entire
cured when the process is ended.

Enuresis nocturna is a very obstinate and very unpleasant malady;
injures the general health and is very difficult to cure. Sometimes
stops spontaneously at puberty. Recent cases are sometimes quick
cured.

Treatment.—Many cases of vesical paresis in women may be avoided
a regular use of the catheter in conditions where the hindrance to eva
uation might lead to paralysis of the detrusor. That is especially t
case with retroflexio uteri gravidi and in puerperal ischuria. In typhu
dysentery, peritonitis, the complication may be prevented by warm bath
by regular evacuation of the bladder, cold abdominal application, ar
the use of the catheter if the patient does not completely evacuate h
bladder. The best means to prevent ischuria is complete evacuation
the bladder with the catheter and then washing out the viscus with a 1 p
cent. salicylic acid solution.

If paresis or paralysis has already set in, there should be regular cath
terization every four hours. But the best remedy at our disposal is i
duced electricity, which has given good results after a few applicatio
in ischuria, in paralytic and paradoxic incontinence, and even in en
resis nocturna. One pole is introduced into the bladder, and the oth
placed upon the symphysis or the os sacrum or in the rectum. In ato
and paresis of the bladder with vesical catarrh left after hyper-distensio
we may use besides the direct faradic current the galvanic one, but on
externally. Erdmann recommends that the anode be applied to the ba
of the head and the third cervical vertebra, while the cathode is plac
over the symphysis or upon the perineum. Fifteen to twenty elemen
may be used for two to four minutes. In children the poles are only a
plied externally The applications are to be made daily, and should la
from three to five minutes. If there are signs of hyperæmia or vesic
catarrh, the course of treatment laid down on page 184, should be begu

In some cases irrigation of the bladder with a 1 to 1000 salicylic ac
solution through a Hegar's funnel every three to four hours will suffi
to remedy a vesical paresis. Internally we should order a robirant die
good wines, especially champagne, and weiss-beer, since it contains

much carbonic acid. Camphor in small doses and tra. of cantharides five to twenty drops one to three times a day may be employed; but they are liable to irritate.

In a recent paresis of the bladder from catching cold, or long-continued retention, secale has often done good service, given as fresh powder ten to fifteen grains four to five times a day, even when the affection occurs in consequence of cerebral apoplexies and other affections of the nerve centres. Allier claims that this drug has done great good in ʒ i doses daily. (Roth, Jacksch, and many others.)

Strychnine has been used both internally and externally in paralysis vesicæ; internally in $\frac{1}{20}$th grain doses (Cory).

If there is incurable paralysis of the sphincter vesicæ C. Rutenberg[1] has recommended the opening of the bladder above the symphysis, the keeping open of the fistula, and the subsequent operative closure of the urethra. The urine can then only be voided by bending forward or using a soft catheter. A suitable retaining bandage and pad may be used.

Finally, to restore continence when the urethra is weak and relaxed, the operation described on page 36 may be had recourse to.

As Barclay has so excellently expounded to us, the treatment of enuresis nocturna must be constitutional, moral, mechanical and specific. Constitutional means are nourishing solid and soluble food, little fluid to be taken towards the close of the day. For medicines we may use quinine and iron. Barclay and Brügelmann join with me in praising syrup ferri iodat. in doses of ℈i. to ʒ i. taken several times a day for months together. Brügelmann cured a girl in this way (S. f. iod. 7; aq. dest. syr. simpl. 50. ʒ iq. 2 hours) in fourteen days.

Moral Means.—Mustard plasters (*i.e.*, beatings) after every wetting, and regular awakening for urination in the very young. For older children and adults, the avoidance of pleasures, balls, concerts, theatres, and society. They should be awakened two to three times every night. Some authors do not believe in punishing the children.

Mechanical means are: Washing out the bladder to diminish its torpor. If the bladder is very small it should be mechanically dilated with injections of warm water. Braxton-Hicks claims to have cured incontinence, which persisted after puberty, in a girl in this way. In a similar case the same surgeon cured a relapse which set in after three months, with first injections of a nitrate of silver solution followed by injections of a solution of morphine.

As specific remedies we may mention chloral-hydrate and belladonna. I have used them both for long periods of time in large and constantly increasing doses in girls from twelve to fifteen years (chloral gr. fifteen to twenty every night.) But I have not seen the permanent good effect which has been claimed to result from their use by Thomson, Bradbury, and Leonardi. We may use extr. belladonna, or the tincture in five to twenty drop doses several times daily, or $\frac{1}{6}$ grain as rectal suppositories. Campbell Black praises narcotics with chloride of iron in cases of atony of the sphincter. Great improvement is sometimes effected by giving girls of ten to fourteen years of age four to five drops of tincture of thebiaca before going to bed.

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[1] Wiener Med. Wochenschrft. 1875. No. 37.

Baths and cold effusions to the back and loins at night have sometimes succeeded when every other method has failed. (Savage.) In one of my cases the malady always got much better in summer; so that I sent her to live in the South. So the warm thermæ of Gastein, mud baths, and even iron-baths may do good in certain cases. Sea bathing is always useful after a cure has been effected.

THE

DISEASES OF THE VAGINA.

BY

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THE

DISEASES OF THE VAGINA.

CHAPTER I.

ANATOMICO-PHYSIOLOGICAL INTRODUCTION.

SINCE the time when the researches of Thiersch[1] and Leukart[2] demonstrated that, in the mammalian embryo, the entire vagina as well as the tubes and the uterus are developed from the Müllerian ducts, all later observers have accepted their conclusions, and have applied them to the human fœtus. And while in the human embryo the union of the Müllerian ducts takes place at a very early period, and is completed according to Dohrn by the ninth week of embryonal life,[3] the differentiation of the simple genital canal into uterus and vagina does not occur until much later. Kussmaul places it at the end of the third month;[4] though Dohrn[5] could not appreciate the existence of a cervix until the fifteenth or sixteenth week. The lower edge of the tube, which later bears the hymen, is found where the genital canal opens into the sinus uro-genitalis. The hymen does not appear before the beginning of the nineteenth week, and is at first a simple projection of the posterior wall from the introitus; soon a smaller process from the anterior wall unites with it to form the half-moon fold.[6]

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[1] Illustr. Med. Zeitung, Munich, 1852, vol. I., part 2, p. 69.

[2] Ibid., vol. I., part 1, p. 1.

[3] Contribution to our knowledge of the Müllerian ducts and the development of the uterus.—Proceedings of the Ges. z. Beförderung der gesammten Naturwissenschaften at Marburg, 1869, No. 3.

[4] On absence, etc., of the uterus, Wurzburg, 1859, p. 10.

[5] On the development of the hymen. Proceedings of the Soc., etc., of Marburg. Cassel, 1875 (Th. Kay).

[6] In regard to the hymen, whose vaginal origin is admitted by all later investigators, comp. P. Budin, Recherches sur l'hymen et l'orifice vaginal, Paris, 1879, (Public. du Progres Médical), and Dohrn, Zeitschrift f. Gebh. v. Gynäkol., 1884, vol. II., part 1, p. 1.

We will follow Dohrn, who thus describes the vaginal changes: onl after the portio vaginalis is fully formed does the smooth-walled genit canal undergo change. Longitudinal growth is rapid during the sever teenth to nineteenth weeks, and the redundant internal coat is force into tranverse folds, which interlace with one another. At the same time the upper part of the vagina dilates, while its lower portion to the extent of $\frac{1}{25}$th to $\frac{1}{5}$th inch, contracts markedly. At the end of that period, a papillary growth appears in the vagina, especially in its middle portion.

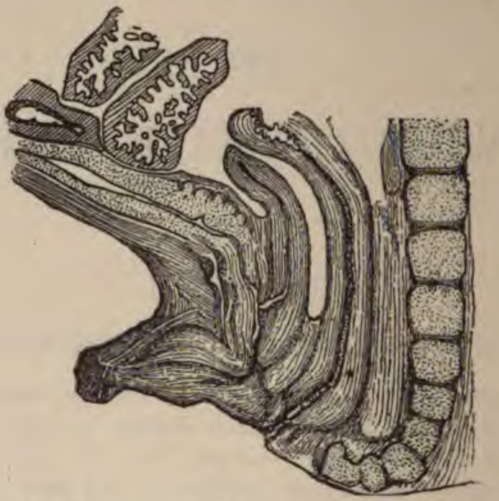

FIG. 1.—SAGITTAL SECTION THROUGH THE PELVIS OF A FEMALE EMBRYO AT THE END OF THE 3D MONTH. Relatively large sexual tubercle. The utero-vaginal canal shows no trace of cervix, and opens into the sinus uro-genitalis. (*Celloidin.*)

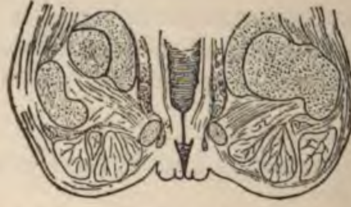

FIG. 2.—FRONTAL SECTION MADE IN THE VAGINAL AXIS (POSTERIOR HALF REMOVED) OF THE PELVIS OF A FEMALE FŒTUS AT 6 MONTHS. (Müller's fluid and alcohol.) Hymen thick. Vagina relatively wide.

Above these, papillæ continue to the vaginal portion of the uterus, and below they extend to the raphé of the sinus uro-genitalis. They are found upon the upper surface of the hymen only; the lower surface and the vestibule being smooth. One week after the first appearance of the hymen it is as fully developed as is usual in the newborn. After the lower portion of the vagina has been almost closed by the hymen, its inferior section dilates, and is limited above by a projecting fold, which may be mistaken for a second hymen. In newborn females the vagina is a relatively wide and long tube, the lower portion being partly closed by the hymenal fold. The structures of its wall and the papillæ are well developed, and an abundant layer of desquamated epithelium is present. According to Huschke,[1] the relative length of the vagina to the entire body is as 1:9, while in the adult it is as 1:15.

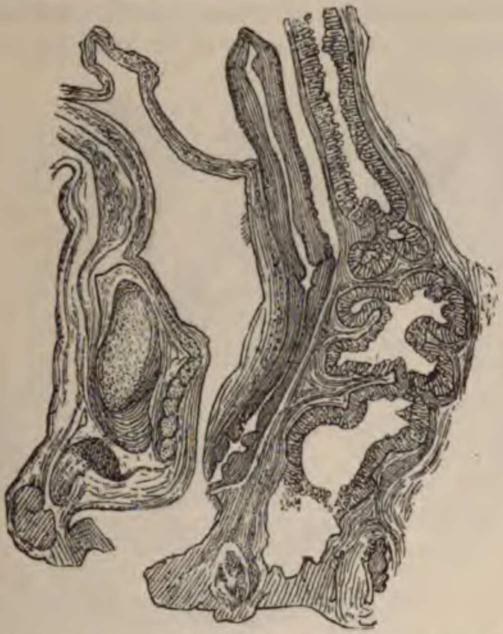

FIG. 3.--SAGITTAL SECTION THROUGH THE PELVIC ORGANS OF A FEMALE FŒTUS AT THE END OF THE 5TH MONTH. Pelvic bones removed. Portio vaginalis and hymen distinguishable. Papillæ on the mucous membrane. Columnæ rugarum well marked. Celloidin embedding.

Freund[2] and Kocks[3] have recently reopened the question as to the persistency of the remains of the Wolffian duct, the Gartner canals. They have described a case in which there were two small openings corresponding to the mouths of these canals near the urethra. The researches made upon the human embryo for the purpose have not sustained the conclusions of these two observers. Kölliker,[4] Dohrn[5] and Rieder[6] found no trace of the Wolffian ducts in the lower portions of the vaginal canal.

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[1] Sömmering. Eingeweide lehre, Leipzig, 1844, p. 536.

[2] Bericht. d. Naturforscherrersammlung zu Cassel, 1878.

[3] Arch. f. Gynäkol. 1883, vol xx., p. 487.

[4] Sitzungsberichte d. phys., Med. Ges. zu Würzburg, 1883.

[5] Arch. f. Gynäkol, 1883, vol. xxi., p. 328.

[6] Virchow's Archiv., vol. 96, p. 100.

According to Dohrn, at about the middle of pregnancy Gartner's ca reaches the uterine substance in the neighborhood of the spot which w later become the internal os. It penetrates the outer muscular layers the uterus, and then descends forwards and inwards to the vaginal vaul In the fornix itself Gartner's canal lies in the concentric tissue lay which surrounds the Laquear vagina, underneath the mucosa. The can dwindles as it proceeds downwards; and in not a single case could Doh follow it to the urethral orifice. But he noticed that traces of the du extend further down upon the right than upon the left side, and he e plains this as being due to the pressure of the rectum. Dohrn finds th

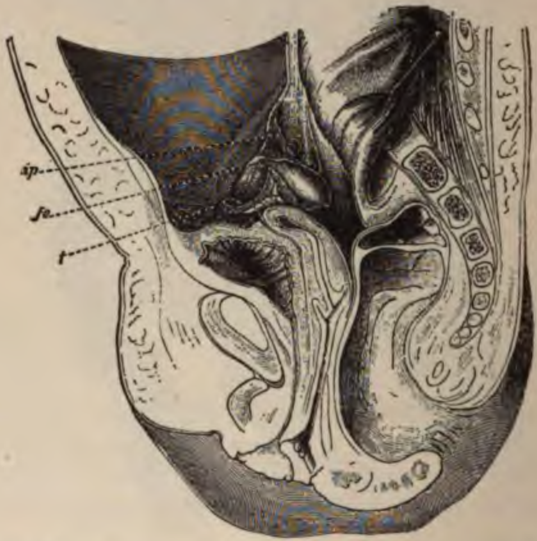

FIG. 4.—SAGITTAL MEDIAN SECTION THROUGH THE FROZEN PELVIS OF A GIRL AGED 9 MONTHS. *i, p*, Ligamentum infundibulo pelvicum. *f, o*, Fimbria ovarica. *t*, Tuba. The axis of the uterus and vagina follows that of the urinary organs. *d, i*, Urethra and bladder. (After *Kölliker*.)

cause of the early disappearance of these ducts in the lower portion of the vagina, in the rarification and stretching which the urethro-vaginal septum undergoes in embryonal growth; and Rieder upholds the same view.

The vagina is situated high up in the fœtus (Figs. 1 and 3), in the new-born child, and in early youth (Fig. 4); and it is much nearer the anterior pelvic wall than is the case in adults. This position is largely dependent upon the situation of the bladder, which in early years lies mostly above the true pelvis; it was formerly supposed to be the normal position of the organ in the mature woman. Recent sections have shown, in agreement with clinical observation, that, leaving out of account the change caused by a full rectum or bladder, the normal position of the vagina is quite a different one. Frankenhaüser[1] is right in his statement that when bladder and rectum are empty, the vagina is not in the pelvis at all, but lies among the soft parts of the pelvic outlet; and that its axis does not correspond with that of the pelvis, but lies in the antero-posterior diameter of the pelvic outlet. (Fig. 5.) The length and breadth of the vagina vary considerably. According to Henle, the posterior wall is 2.8 inches long upon the average, while the anterior wall is $\frac{1}{5}$ to $\frac{4}{5}$ inch shorter. Its greatest width is at its upper portion near the fornix vaginæ; it is narrowest at the entrance, where the hymen is situated. The walls of the vagina are applied together so as to form a square, transverse slit, about 1 inch in breadth; and so that a sagittal section will give one a linear orifice. At various places we will, however, find upon minute examination that, owing to the columna rugarum, the transverse slit is irregular. Thus Henle makes the section |——|-shaped. (Fig. 6.) In children and young people the square is relatively narrow.

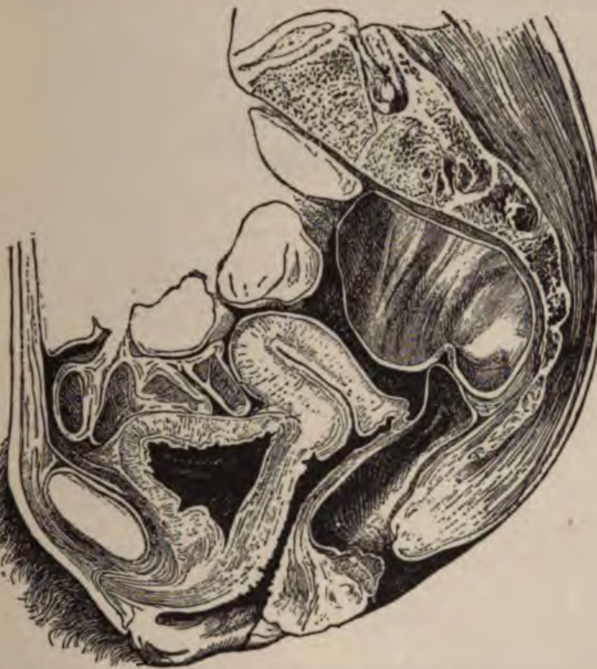

FIG. 5.—SAGITTAL PELVIC SECTION. After a preparation by Prof. Waldeyer; from a drawing kindly loaned to me by the Strasburg Gynecological Clinic.

Since the vagina is the tubular duct of the uterus, and is formed with it from the Müllerian ducts, the tissues and various layers of the two organs are directly continuous and of the same construction. The walls are thinnest in the upper part, being not over $\frac{1}{25}$th of an inch when emp of blood. Towards the orifice they become thicker. The anterior pill of the columna rugarum is the stouter; it reaches to the introitus, whe its projection beneath the orificium urethræ forms the carina vagin (Kohlrausch), or the tuberculam vaginæ (Luschka). The posterior colum usually lies somewhat higher up. Irregular lateral branches spring fro both columns, anastomosing at their extremities; hence the roughness surface of the virgin vagina. For further details we must refer the reade to the anatomical text-books, and especially to Henle.

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[1] Correspondenzbl. f. Schweizer aerzte, 1876, VI. Jahrg., p. 415.

Cross sections of the vaginal wall show an internal and dense muco

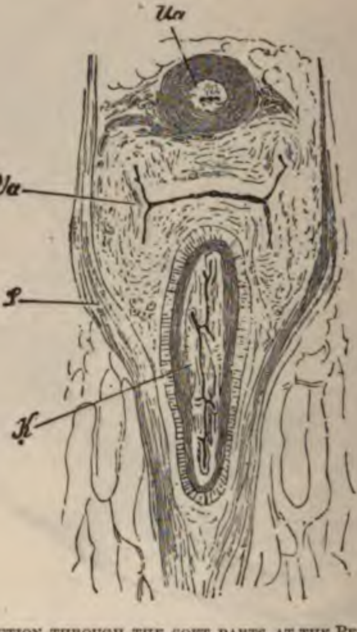

FIG. 6.—HORIZONTAL SECTION THROUGH THE SOFT PARTS AT THE PELVIC OUTLET. (After *Henle.*)

coat, and an outer looser muscular coat, intimately connected with it. Around the latter is a connective-tissue envelope, in which the larger vessels and nerves ramify. (Membrana cellularis s. adventitia.) This latter coat is not of the same density throughout; in the recto-vaginal and vesico-vaginal septa it is looser, and in the former position it contains fat. The mucosa is provided in varying degree in different places with microscopic papillæ; they are mostly simple, though on the columna and near the introitus they are compound. The mucosa consists essentially of a dense connective tissue, containing abundant elastic elements and delicate bundles of muscular fibres. The vascular muscularis is formed of masses of smooth muscular fibres, bound together by a connective-tissue framework.

According to the most recent authorities, the innermost muscular layer is longitudinal, while the external one runs in a circular direction.[1] So far as I know, Luschka[2] only is of a different opinion. I myself have examined a number of preparations in conjunction with Professor Eppinger, and have always found the inner layer to be transversely and the external to be longitudinally arranged (Figs. 7 and 8), and Professor Toldt has had

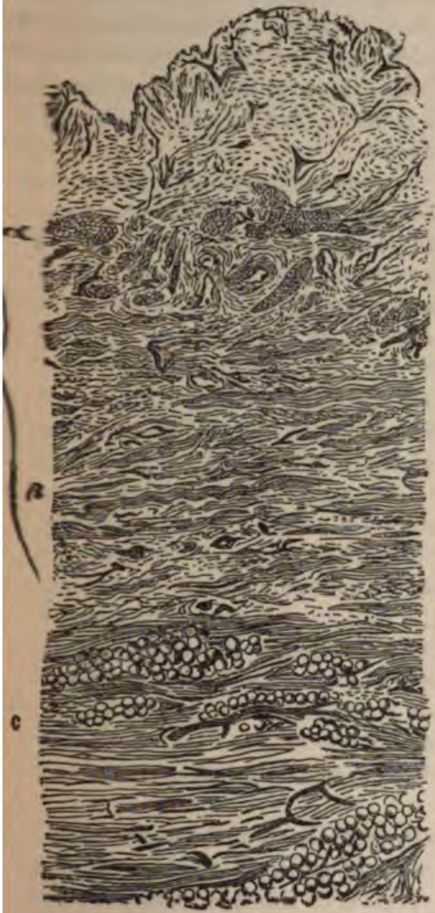

FIG. 7.

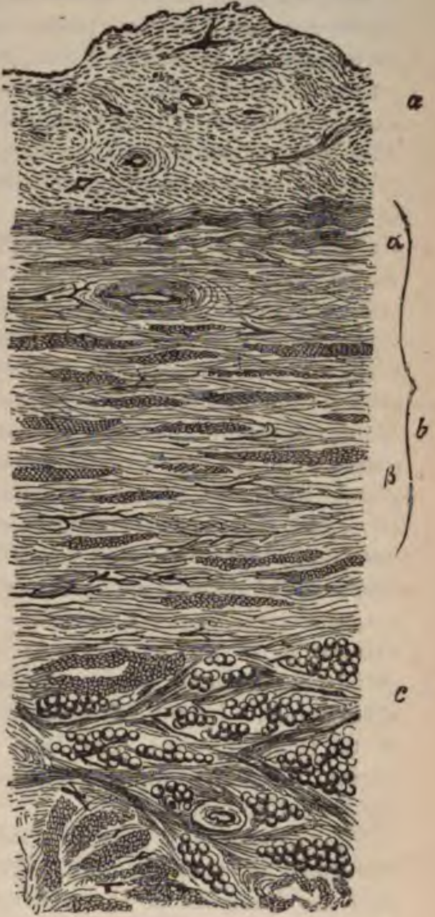

FIG. 8

FIG. 7.—LONGITUDINAL SECTION.

FIG. 8.—TRANSVERSE SECTION THROUGH THE POSTERIOR VAGINAL WALL OF A GIRL 24 YEARS OLD. Letters alike for both. *a*, Mucosa. *b*, Muscularis. *c*, Submuscular layer containing fat. *α*, Circula. *β*, Longitudinal muscular layers.

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[1] Henle, l.c.; Klein in Stricker's Handb., Leipzig, 1871, p. 160. Frey, Handb. d. Histolog., Leipzig, 1876, p. 543.

[2] Anatomie des Beckens, Tubingen, 1868, p. 387.

the kindness to show me some preparations of his which show the same arrangement. But we saw the arrangement, described by the authorities, where the section fell exactly upon a columna, especially the anterior one. And not only does the arrangement, as we found it, conform to the general type of muscular layers surrounding passages, and especially to that of the uterus, but it better explains the circular vaginal contraction which we occasionally meet with clinically. Toldt (l. c.) has recently stated that we can find in a general way an external dense layer of longitudinal fibres, and an inner non-continuous one which is mostly circular, but still it contains longitudinal and oblique bundles of fibres.

Several layers of epithelial cells cover the mucous membrane, consisting of large, nucleated, angular cells. According to v. Preuschen[1] the deepest layers contain cylindrical cells with elongated nuclei. The scanty mucus which normally covers the surface is sour in reaction; it is just sufficient to keep the surface moist, and contains no formed elements save epithelial cells. Foreign substances are, of course, often present, from the free access which atmospheric air may have to the part; and among these foreign substances the lowest organisms are especially worthy of our attention. We will consider them elsewhere. V. Preuschen[2] has described in the crypts of the mucosa of the upper vagina conglomerate glands, lined with ciliated epithelium. Most anatomists deny their existence, and they certainly occur exceptionally, if at all. Some recent observations, however, would seem to confirm the statement.[3] Gland-like crypts of the mucous membrane are common enough, and sometimes form extensive blind passages, especially in the vicinity of the introitus and the extremities of the columns. It is doubtful whether the conglomerate glands which Henle saw in one case are not to be regarded as pathological appearances. Lymph follicles, similar in structure to the solitary glands of the small intestine, have been found by Löwenstein[4] in the human vagina. Toldt and Chiari have also noticed lymph-follicle-like bodies imbedded in the mucosa.

The vagina gets its arterial blood chiefly from the vaginal arteries which run along its posterior wall. Their mode of origin is variable; usually they are branches of the uterine, hypogastric, internal pudendal, or hemorrhoidalis media arteries; but Farre[5] has seen them arise from the obturators. As a rule two of them run down the posterior wall. In every case, however, branches of the pudendal and the vesical take part in the arterial supply of the vagina. According to Gussenbauer[1] the art. vagin. is usually a fairly large branch of the hæmorrhoidalis media, and it runs in the median line from behind forwards in the posterior vaginal wall outside the muscular layer. As it runs it gives off branches which pass off at right angles to supply the lateral vaginal walls. These branches pierce the muscular layer obliquely, and, breaking up into a capillary network in the submucosa, send loops of vessels into the papillæ of the mucous membrane.

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[1] Virchow's Archiv., vol. 70, p. 6.

[2] Ibidem.

[3] Thus C. Ruge found in a case of atresia hymenalis very distinct glandular structures upon the inner service of the hymen. Hückel and Heitzmann found them where v. Preuschen did.

[4] Centralbl. f. Med. Wissensch, 1871, p. 546.

[5] Todd, Cyclopædia of Anat. and Phys., vol. 5 (Supplem.), London, 1859.

While at the fornix and its neighborhood simple vascular loops supply the papillæ, at the ostium vaginæ, and especially over the columna rugarum, the compound papillæ are supplied by an anastomosing capillary plexus, which springs from the submucosa by fairly strong branches. In the middle of this net-work the veins arise. In the columns these latter vessels are numerous and large, and arranged in plexuses, and especially at the lower portions of the columns they give the tissue a cavernous appearance. The veins which collect the blood from the mucous membrane form elongated meshes in the submucosa parallel to the longitudinal axis of the vagina. They unite into larger branches in the muscularis, and form in the connective tissue between vagina, urethra, bladder and rectum the so-called plexus venosus vaginalis. Many veins from the bulbus vestibuli enter the plexus in its anterior part; while its posterior division is gained by those labial veins which do not join the pudendal. In the posterior vaginal wall, alongside the art. vagin. run two fairly large veins, which receive the blood of the plexus; they empty into the plexus hemorrhoidalis.

Gussenbauer does indeed find that the structure of this plexus ven. vag. is similar to that of the cavernous erectile organs; but the vaginal vessels, when full, never attain that degree of stiffness which the vestibular structures do, resembling rather, as Henle puts it, a filled sponge which can easily be emptied by pressure.

We know but little concerning the minute ramification of the vaginal lymphatic system. The nerves come from the sympathetic and the pudendal plexus. Isolated groups of ganglion cells are found where two or more medullated fibres come together. (Klein.) Their mode of termination in the human subject is not known. In rabbits and dogs Chrschtschonowitsch[2] traced them as delicate non-medullated fibres accompanying the vessels and forming a sub-epithelial net-work. From this plexus the finest fibres penetrated the deeper layers of the epithelium, and formed a mesh of nerve-fibres surrounding the epithelial cells, among which larger branched bodies were found, analogous to the Langerhans bodies of the rete Malphigi. In general the sensibility of the human vagina is but small. Even, in the neighborhood of the introitus, operations can done without narcosis. There are, however, exceptions; and the vagi may be the seat of violent neuralgias.

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[1] "On the vascular system of the external female genitals." Sitzungsber, d. K. K. Akad. d. Wissensch, Wien. 1870, vol 60, p. 534.

[2] Sitzungsber, d. K. K. Akad. d. Wissensch, Wien. 1871, Bd. 63, p. 301.

The connections of the vagina are most intimate at the entrance. Th lower portion of the anterior wall is closely bound to the urethra, a the lower part of the posterior wall is attached to the perineum. Furthe

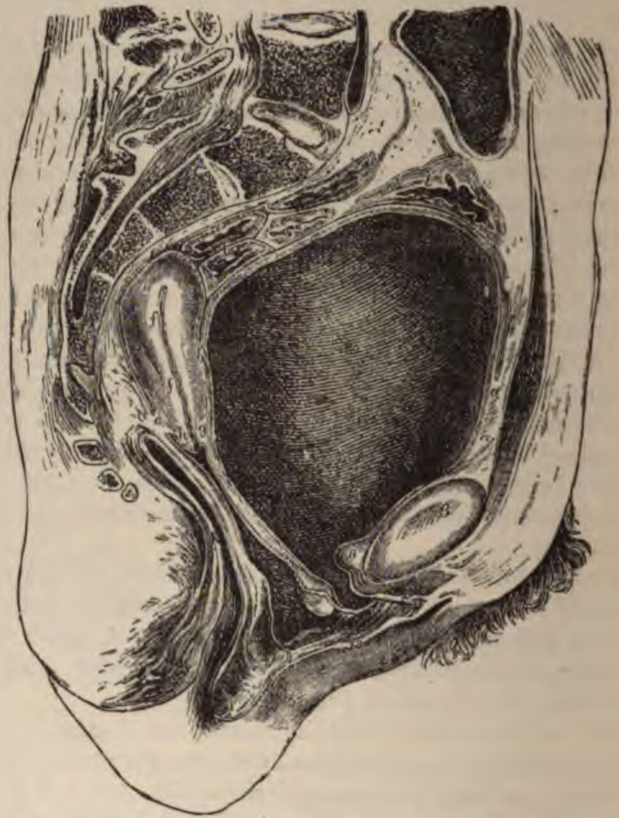

FIG. 9.—DIRECTION AND SHAPE OF A SAGITTAL VAGINAL SECTION WITH THE BLADDER HYPERDISTENDED. (After *Pirogoff*.)

up the connective-tissue union with the bladder, rectum, and the ligamentum latum is looser. Since the peritoneum of Douglas's *cul-de-sac* covers a part of the upper posterior wall, we can divide the hinder vaginal surface into an upper peritoneal, a median rectal, and a lower perineal portion. The anterior wall may be said to consist of a lower urethral, and an upper vesical part. The lateral portions of the vaginal vault are, corresponding to the base of the ligamentum latum, partially covered with peritoneum.

According to Luschka,[1] the ureters must not be forgotten here; in spite of their convergence, their vesical mouths are still an inch apart. The lateral portions of the vagina are covered by the vascular connective tissue, which is supported by the diaphragma pelvis. Both this tissue and the connective tissue surrounding the lower posterior portion of the vagina contain much fat, which forms an elastic cushion for the vaginal walls. (Kiwisch.)

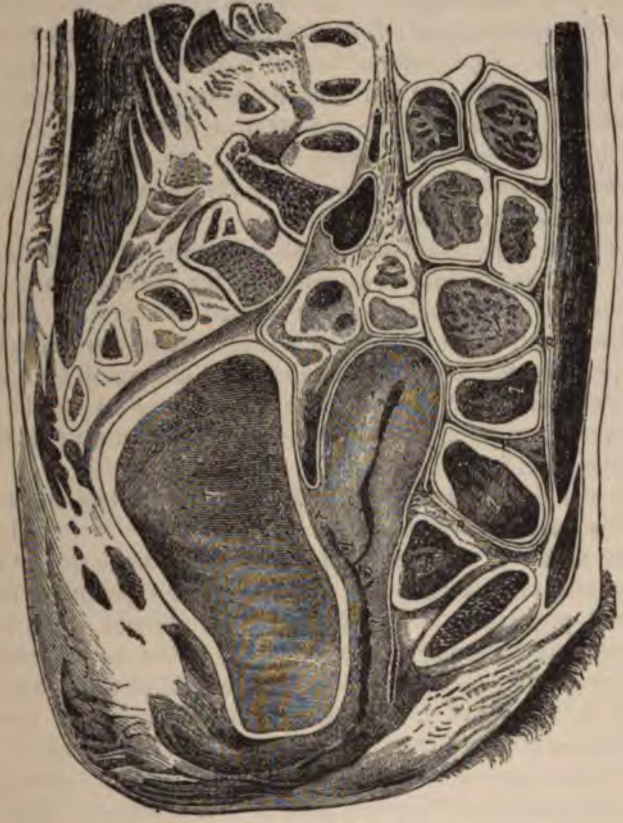

FIG. 10.—DIRECTION AND SHAPE OF A SAGITTAL VAGINAL SECTION WITH THE RECTUM DISTENDED. (After *Pirogoff*.)

These connections make plain the fact that the organ in question must be subject to many changes of position and axis. This is not only the case during conception and childbirth, though the dilatation and dislocation they may cause may be very considerable. A distended bladder and rectum may change the direction, shape, and length of the vagina. This will be plain from the sections shown in Figs. 9 and 10. If in spite of these variations the general position and shape of the vagina is mai tained, it is due to the elasticity and tonus of the stretched recto- a vesico-vaginal septa, and to the integrity of the suspensory and suppor ing structures. So long as the ligamentous connections between pelvi bladder, uterus, and rectum (lig. vesicalia, pubo-vesico-uterina, rect uterina, recto-sacralia) remain tense, and the peritoneal covering of t posterior and lateral vault is intact, the vagina will be sustained by i connections with other organs. The best supported of all is the anteri division of the anterior wall; it is attached to the urethra by the pelv connective tissue. The posterior vesical portion rests upon the posterio wall; and the posterior wall rests with its supra-perineal portion upon the rectum, while its perineal portion rests upon the structures of the perineum. Clinical experience teaches us that the muscular floor of the pelvis plays an important part in sustaining the vagina; but the subject has not been examined into anatomically.[1]

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[1] Arch. f. Gynak., Bd. 3, p. 378.

There may be very considerable variations within normal limits in adults. I will only mention congenital shortness of the vagina, always combined with prolapse and retroversion of the uterus. In another place we will consider the variations in length and breadth, which are dependent upon age. In children the conditions of later fœtal life persist for a long time. When senile involution of the genitals occurs, the vagina shrinks in length and breadth, especially in the vault, and the atrophied mucous membrane becomes smooth and pale.

Nor are the disturbances caused by gravidity of less moment. The general hyperplastic development of the part causes increase in size and in laxity of texture. The participation of the muscularis in the process can be not only anatomically but also functionally proven in the vaginæ of advanced pregnancy. We often feel contractions when examining women pregnant for the first time, especially of the crescent-shaped folds of the anterior wall; at other places they are not so plain, and are only noticeable during delivery, when the vagina has not been over-dilated, nor has lost contractility from too long-continued pressure of the fœtal head. The peri-vaginal connective tissue is also greatly loosened in pregnancy; its fat disappears (Kiwisch) and its vessels dilate.[2] These changes enable the vagina to undergo the enormous dilatation, the traumatisms and displacements to which it is inevitably subjected during delivery. The greatest amount of longitudinal stretching during delivery occurs in the posterior wall; hence the frequent ruptures in this situation. We can appreciate even at the beginning of labor the fact that the posterior vaginal *cul-de-sac* ascends, sometimes even to the height of the middle of the pubis, while before it was at the level of the tuberosities of the ischia. As the head descends into the vagina, the anterior wall also descends, but the posterior wall remains higher up, and is therefore more tense.

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[1] Not that there have been no excellent and minute anatomical studies; but that they have not been made with reference to this point. Comp. Lesshaft on the perineal muscles and fascia in women, in Gegenbauer's Morph. Jahrb. 1884, vol. 9, p. 475.

[2] Klin. Vorträge, vol. 2, 3d ed., p. 363, Prag. 1857.

CHAPTER II.

CONGENITAL MALFORMATIONS OF THE VAGINA.

SOME malformations of the vagina have been already considered with malformations of the rectum[1] and the bladder;[2] and some others occur in connection with so faulty a development of the internal genitals, that they do not form the object of surgical treatment.[3]

We will only here consider those malformations which give rise to dangers which we must try to prevent, or cause physiological disturbances of function which we can endeavor to rectify. There must be no important developmental fault in uterus and ovaries, so that the difficulties which our surgical interference is called upon to allay are those due to vaginal malformations alone.[4]

We will, therefore, have chiefly to deal with the congenital atresias and stenoses of the simple and divided vagina, and those cases in which longitudinal septa exist.

The mode of origin of these malformations is not entirely clear. The presence of longitudinal vaginal septa may be due to a survival of a structure which normally disappears at about the ninth week of embryonal life, namely the septum of the coalesced Müllerian ducts; but the causes of atresia are not so simple.

There is some reason to believe that the supposition is correct which explains atresias of the upper and middle portions of the vagina as being due to the loss of the existing lumen of the divided or united vaginal portions of Müller's ducts. Inflammatory compression, etc., after loss of the vaginal epithelium in the fœtus, may perhaps cause pathological contraction of the original lumen; but we can hardly understand how, when there is a complete upper and a lower vestibular portion of vagina, an intermediate portion may be absent.[1] It is different when the lower vaginal part is wanting. Of course there may have been a total defect of the lower parts of the Müllerian ducts, and their ends may not have reached the aditus uro-genitalis· thus ending as blind sacs, and causing the vagina to be absent in part.

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[1] Esmarch. Diseases of the Rectum and Anus (in this collection).

[2] Winckel. Diseases of the Female Urethra and Bladder (this work.

[3] We would refer our readers for a full consideration of these anomalies to the later text books of pathological anatomy—especially Klebs, Handbuch, 4th ed., Berlin, 1873.

[4] The repeated attempts which are made to form a vagina where no developed uterus exists have failed to provide an organ of copulation where there was none. L. Heister in his Surgery (2d ed., Nuremberg, 1752, p. 889), has long ago given the correct surgical indications for the operation.

There are very great difficulties in the way of a decision as to the genesis of individual cases, both clinically and pathologically. The clinical observer may even be unable to decide whether a simple atresia in an adult is congenital or not; the history will often leave us unable to exclude stenosis acquired in early childhood; since other undoubted congenital malformations may be absent; and the cicatricial contractions and bridges which generally point to an acquired atresia, may have been left by a late fœtal inflammation. Hymenal atresia, however, is excessively rarely found as an acquired condition.[2] It is of relatively late fœtal formation, since, as Dohrn[3] has recently shown again, the first traces of the hymen are only shown at the nineteenth week of fœtal life. The union of the hymenal folds would therefore cause a hymen imperforatus.

Let us first consider congenital atresia with a simple genital canal. For practical purposes we may divide them into those of the lowest portion of the vagina, and those that lie above that portion, and into broad and narrow atresias, in accordance as they involve broader or narrower vaginal zones.

The breadth of the atresia is of course partly dependent upon the amount of stretching the part undergoes from the accumulated menstrual blood; it may be of membranous thinness, or 1.2 inches thick. The older authors record cases where the atresias were three, four, or more inches broad. White is said to have successfully operated upon one five inches long. These figures are not to be taken exactly, and probably only represent the length estimated by the surgeon.

Atresias which involve the entire length of the vagina, are probably only found in connection with atrophied uteri.

Among seven specimens[4] of congenital atresia of the simple vagina, which are contained in the patholog-anatom. collection in Prague, the is but one case of high-seated atresia of some breadth (1.2 inch), wh two specimens show total atresia with atrophy of the uterus. In t remaining four cases the atresia was in the lower third or near the e trance. In five cases of total atresia in the living subject, I observe rudimentary development of the uterus; and in three cases there was n trace of the organ at all. In one large handsome woman, twenty yea old, with large and well-developed mammæ, but undeveloped nipples, found a regular vulva with ruptured hymen; but the labia minora were very small, and there was exceptionally little hair upon the mons veneris. The vagina formed a blind sac 2½ inches long, and its columns were imperfectly marked. A careful recto-abdominal examination showed no trace of the uterus; the plicæ Douglassii lay directly against the bladder. In the left inguinal region of the abdominal cavity was an elongated, smooth, somewhat movable body, the size of an almond; on the right side, deeper and more difficult to reach, was a similar one. The pelvis was but little inclined; and though the hips were broad, the pubic arch was narrow. The palpably incorrect statement was made that there had been occasional slight menstruation since the sixteenth year. The case reminded me vividly of the one Steglehner observed, of female external genitals with the presence of the testicle, though I could not demonstrate the existence of the vasa deferentia. I was told, however, that the patient had been repeatedly noticed to manifest erotic inclinations for young girls, which would point towards hermaphroditism.

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[1] Some confusion has crept into our genetic conceptions of vaginal atresia, from the repeated statement that the vagina is formed of two parts, an upper and a lower, which grow towards one another, and which occasionally do not meet. The lower portion does not belong to the vagina at all, not being formed from the vaginal portion of the Müllerian duct. It represents the vestibulum vulvæ (Aditus uro-genitalis).

[2] Steiner's communication from Billroth's Klinik. Wien. Med. Wochenschr. 1871, No. 30.

[3] On the Development of the Hymen. l. c.

[4] I examined these specimens in 1878. I owe it to the friendship of my esteemed colleague E. Klebs that I had an opportunity to examine the rich stores of the Path. Anat. Institute, then under his direction. A later review of this portion of the collection, at which the present director of the Institute, Prof. Chiari, was

The sequelæ of atresia, which depend upon the accumulation of secretion above the place, seldom appear before puberty; hence the majority of cases have been observed in adults.

Nevertheless, dilatation above the atresia may occur in young children and in the newborn, and may provoke an investigation. G. Veit mentions an observation of Godefroy,[1] where, in a child two months old, there was such an accumulation of mucus behind an imperforate hymen, that it caused difficulty in the evacuation of urine and fæces.[2] I have myself seen dilatation from retention of the vagina and the collum uteri in specimens showing atresia in newborn girls. I also saw later, in two newborn females, a very thin membrane closing the lower portion of the vagina, close behind a well-formed hymen. Through the dilated hymenal membrane the colorless, transparent, and shining septum was seen to project in an arched form as soon as the children cried. When

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kind enough to demonstrate the new specimens to me, revealed the important fact that there was not a single specimen which showed atresia of the fully developed genital apparatus. This is to be explained by the fact that none of the clinically observed cases were fatal.

[1] Godefroy, Gaz. der Hôp., 1856, No. 142.

[2] Arch f. Gyn., vol. 2, p. 84.

the tension was relaxed the little finger could be passed into the opening of the hymen, and the fact be ascertained that the septum was entirely distinct from it. The bladder-like, cherry-sized tumor, which during the first two days projected through the vulva when the child cried, caused the parents great anxiety; but the tumor disappeared without a trace upon the third day, with the evacuation of a large amount of thick, milky mucus, containing much desquamated vaginal epithelium. The thin, transparent nature of these membranes, and their sudden disappearance when once they are ruptured by abdominal pressure, render it probable that there were only adhesions of folds of the mucous membrane behind the hymen. Since then I have encountered a case of a firmer septum retro-hymenale of this nature, in a virgin fifty-four years old, suffering from sarcoma uteri.[1] Perhaps some cases of so-called double hymen belong to this little-noticed form of atresia.

I have but once met with true atresia hymenalis in a newborn girl. The child was well developed, measured 20.3 inches, and weighed 118 ounces. Its genitals were otherwise perfectly normal. The hymen was formed by a closed membrane, the posterior portion of which was bellied forwards as a pea-sized, yellowish-white bladder. The walls of this bladder were continuous with the surface of the hymen, and the margins were covered with vascular twigs. On opening it a copious thick, mucoid secretion appeared, which showed under the microscope masses of well-preserved pavement epithelial cells. (Table No. I.)

After completed sexual development, the consequences of vaginal atresia depend naturally upon whether a regular menstrual hemorrhage occurs or not. Thus exceptionally vaginal occlusion, or atresia of one canal in a divided vagina, may exist in cases where maladies accompanied by amenorrhœa are present, and no retention of blood above the atresia occurs. Mucus rarely causes trouble in adults. (Bryk.)[2]

As a rule, the blood accumulation causes the usual sequelæ of the molina menstrualia, and the development of hæmatokolpos and hæmatometra. The troubles depend partly upon the height at which the atresia is seated, and partly upon the amount of menstrual blood which has been poured out. Occasionally, after three months' menstruation, with deep-seated atresias, we may be able to detect considerable stagnation tumors; while in other cases the accumulations may be very small after the molimena have lasted for years.

In every deep-seated atresia the vaginal tube dilated with blood will form a large part of the retention-tumor. As G. Veit remarks, it may occasionally, even before dilating the uterus, cause such difficulties in urination and defecation, as to lead the patient to consult a physician.[3]

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[1] Prager Med. Wochenschr. 1878, No. 18.

[2] Wien. Med. Wochenschr. 1865, Nos. 11–18.

[3] I saw a splendid case of this kind recently in a strong girl, 19 years old. With-

When uterine dilatation occurs, it is chiefly the cervical portion which i affected, and which, with the vagina, contains the great mass of the blood. The vaginal dilatation may be so great in every direction, that its upper end projects above the lesser pelvis, while its lower end (when there is hymenal atresia) presses the labia and perineum outwards; it occupies the greater part of the pelvic cavity, and compresses and displaces both bladder and rectum.

Nevertheless the dilatation causes hypertrophy, and not thinning o the vaginal walls. In the specimens which I examined, the thickness of the hypertrophied vaginal wall above the atresia was $\frac{1}{8}$th to $\frac{1}{3}$d of an inch;

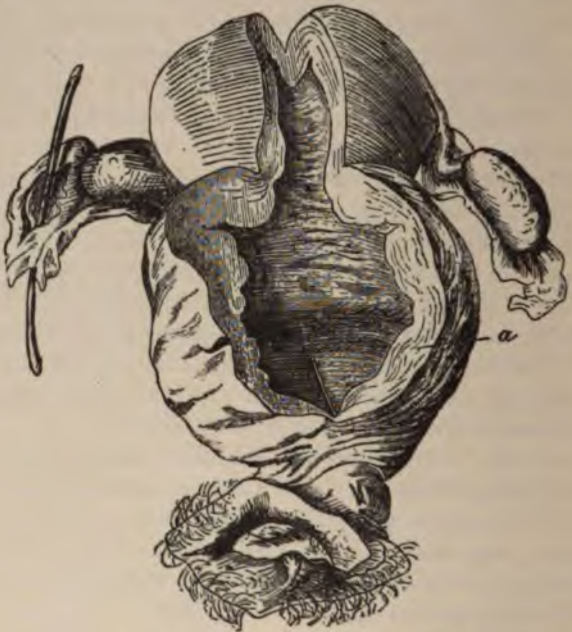

FIG. 11.—*a*, Vaginal wall above the atresia.

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out any characteristic molimena a hæmatokolpos had formed which filled the entire true pelvis, and projected above it. I was consulted because the physician who was treating it had caused suppurative decomposition of the retained blood and high fever by an attempt at sounding. There were some thin places in the hymen, one of which had been ruptured in the attempt to pass the sound, which had thus given rise to decomposition. At the operation I emptied out a large amount of decomposed hemorrhagic matter; and I noticed the enormously dilated and thickened but smooth vaginal walls, whilst the portio was closed and of the normal shape. Antiseptic injections were at once necessary. The fever disappeared promptly; but the mucosa was so altered by the endokolpitis that though the patient's general health was perfectly good, it took several weeks of antiseptic irrigation to restore it to its normal condition. (Table No. 5).

and in two alcoholic specimens it reached ⅖ths of an inch. The microscope showed that it was the muscularis which was chiefly involved in the hypertrophy. In the living subject I could very plainly convince myself, in four cases of atresia hymenalis, that with the hypertrophy there was a marked increase in the contractility of the vaginal wall.[1] This dilatation with hypertrophy may be well characterized by Rokitansky's term "eccentric hypertrophy."

Fig. 12 gives an anterior and Fig. 11 a posterior view of a preparation (No. 164), which is opened so as to show the condition of the vaginal walls above and below the atresia.

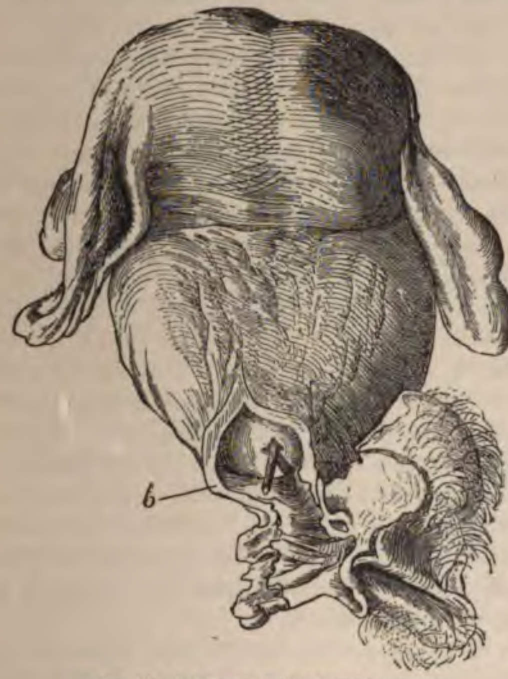

FIG. 12.—*b*, Vaginal wall below the atresia.

The case was that of a girl twenty-three years old, who was operated upon by Professor Fritz, on the occasion of the meeting of the "Deutscher Naturforscherversammlung" at Prague, on September 21st, 1837, and who died upon the same day. There is no history nor record of autopsy; the preserved specimen appears as follows:

External genitals normal; remains of hymen small, and absent at the rear; frenulum lab. preserved; vaginal entrance large. The lower part of the vagina below the atresia stretches 2.8 inches posteriorly and to the left, and two inches anteriorly and to the right, measured from the posterior commissure. The mucosa is everywhere well preserved, without scars; the vaginal wall averages $\frac{1}{10}$ of an inch in thickness. This lower portion of the vagina is closed from above by a convex mass with smooth mucous membrane, which bears some resemblance to an enlarged portio vaginalis. It is formed by the depressed and closed portion of the vagina, and is pierced towards its middle by an angular opening, which leads into the anterior wall of the upper and greatly dilated portion.

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[1] Prager Med. Wochenschr. 1876, No. 7, and Tables Nos. 2, 3, 4, and 5.

Above the atresia the vagina is perfectly smooth, much dilated, and its walls are $\frac{1}{8}$ of an inch thick. Its length is about two inches. The collum is also dilated; the isthmus is marked by a constriction which can be seen externally; and the internal os is large and prominent. Length of collum is 1.4 inches. Its mucous membrane shows the net-work of an arbor vitæ; and over the body it has been somewhat shrunken by the spirit. The uterine wall at its thickest cervical part is .8 of an inch, in the body it is .6 of an inch in thickness. The body cavity is small as compared with the common cavity formed by the collum and the upper segment of the vagina. Uterus is 4.4 inches long, 3.8 inches broad between the opening of the tubes, and 1.8 inches broad at the isthmus. The left tube is much dilated, though it is not bent; and 1.2 inches from the ost. abdom. it is transformed into a thin-walled blood sac about .8 of an inch in breadth, which shows a longitudinal tear with irregular edges. In the neighborhood of this sac, the parietal layer shows peritonitic pseudo-membranous adhesions. Ovaries large and smooth; left shows false membranes. Right adnexa are free, tube not dilated, and no blood-clots upon it. No trace of a fresh superficial corpus luteum.

The amount and quantity of the retained blood, depends upon the seat and duration of the atresia. In contra-distinction to what is seen in hæmatometra, the blood in hæmalokolpos often contains a considerable admixture of vaginal epithelium.

In the section on hæmatometra the effects of blood retention upon the tubes will be thoroughly considered. Here we need only state that the dangers of hæmato-salpinx only exceptionally end in a spontaneous and favorable way. This occurs when the membrane causing the atresia is thin enough to give way finally before the ever-increasing pressure of the retained fluid, aided by the force of the utero-vaginal and abdominal pressure. This occurred for instance in Zannini's case, where a girl twenty years old had hymenal atresia and retentio mensium for seven years. And the point of rupture is not always at the most favorable spot; Schaible saw one perforate the rectum, and in the cases of unilateral atresia to which we shall shortly refer, it most frequently occurs through the septum uterinum.

From the rarity and uncertainty of spontaneous evacuation, we must regard the prognosis of vaginal atresias which are left to themselves as bad, and the indications for operation are pressing in every case.

The diagnosis of congenital vaginal atresia will be aided by the history. It will be stated that the menses have never set in, though there occurred at first typical and later atypical molimena. In the meantime a tumor had developed. If the atresia is high up, it has grown upwards; if low down it has appeared in the pelvis, and has caused difficulties in urination and defecation.

In general the objective diagnosis of atresia presents few difficulties; the retaining membrane can generally be seen or felt, and the tumor appreciated above it. It will be useful for diagnostic purposes to separate hymenal atresia from the other congenital vaginal atresias.

Atresia hymenea or hymenalis, not only differs in situation from more deep-seated atresias, but, since the passage is closed by a membrane composed of a duplicature of the mucous membrane, it will, even when greatly developed, retain the characteristics of a narrow and very elastic diaphragm-like atresia. These features are important to distinguish it from deep-seated and depressed vaginal atresias, when the vestibule leads into a blind sac; for with the latter we never have that distension of the vulva and the perineal region which has caused hymenal atresia to be often compared to the tense bag of waters during delivery. When this vulvar and perineal distension is great, the frænulum laborium and the labia are dragged out of place, and the position of the hymen is altered. The relation of the membrane to the orif. urethræ indeed is not altered; but it reaches immediately down to the perineum posteriorly, and laterally presses against the internal surface of the labia. It is further to be remarked, that by many observers the imperforate hymen has been found to be unusually thick and fleshy; hence the rarity of spontaneous rupture. According to two observations, (comp. Tables No. 5 and 6), it appears to me that the hymen septus imperforatus is most prone to spontaneous opening; since in both I found thin places in the walls of the median septum.

The following case of atresia hym. is very characteristic, and deserves mention. (Figs. 13 and 14.)

Christine S., seventeen years old, always healthy, has never menstruated. For three months has suffered from severe monthly molimena, lasting several days. The patient has noticed a tumor growing in her abdomen, which she says extended from the external genitals up into the abdomen. Latterly she had had considerable difficulty in urination and defecation, and this had led her to apply for relief. The amenorrhœa and the abdominal tumor, and especially the distension of the external genitals described below, had caused her friends to suspect pregnancy and the beginning of labor; so that it was not deemed wise to permit the patient to journey from her home to Prague, without being accompanied by a midwife.

On December 27th, 1875, I found her condition to be as follows: Small strongly-built girl of healthy appearance. No fever. Breasts well developed, but contained no milk; papillæ and areola almost pigmentless. Pelvis well developed. Slight pigmentation along the linea alba. Abdomen swollen, mostly below the navel, where she measured thirty inches in circumference. The swelling is caused by a median tumor, which projects above the symphysis; it is elongated and rounded, of slight lateral mobility, and reaches 8.2 inches above the symphysis. Its upper part is 3.6 and its lower portion 3.2 inches broad; the latter is slightly sensitive to pressure. The external genitals are regularly developed, and both they and the perineal region are distended so as to form a hemispherical mass, the size of a child's head. The vulva is open to the extent of two inches; and between its lips there projects a hard and tough dry vascularized membrane, of the color of ordinary skin. This membrane is laterally in connection with the internal surface of the labia, posteriorly with the anus, which is two inches long, and anteriorly with the posterior border of the urethral orifice. It is the imperforate hymen. Fluctuation is distinct, and it can be gotten between the abdominal wall and the hymenal membrane. Occasionally there is a spontaneous increase of pressure in the tumor. Per rectum the tumor appears as a fluctuating mass, which almost completely fills the true pelvis, and compromises the calibre of the rectum.

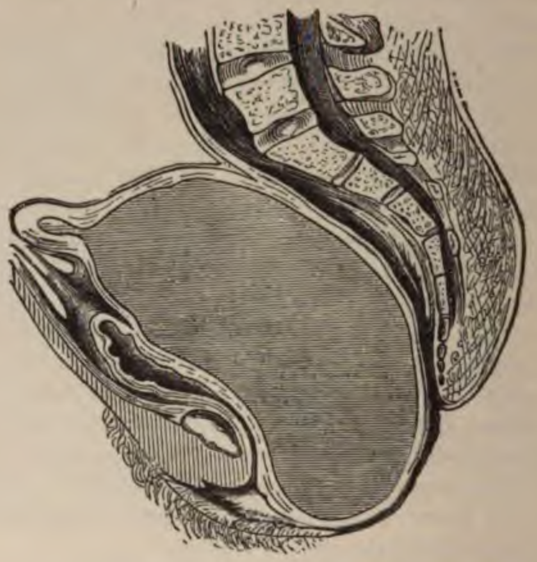

FIG. 13.—ATRESIA HYMENALIS.

On the next day, under chloroform, and avoiding all external pressure, I made the usual crucial incision of the hymen. Fifty ounces of thickened dark odorless blood at once flowed out; it contained both fresh and shrivelled blood corpuscles, and much large pavement epithelium.

Recovery was perfect. The patient was kept strictly to bed; no internal examination was allowed; and cloths soaked in chlorine water were placed over the external genitals. Only on the day after the operation was there a moderate sanguineous flow. At the next examination, (January 4th, 1876,) I found the opening plenty large enough to admit a finger, though the hymenal flaps were thick. The vagina, greatly lengthened and dilated, was much folded upon itself, the anterior and posterior walls being in apposition. During the examination there occurred violent vaginal contractions, which the patient herself could feel. January 7th: Hymenal opening relaxed; remnants over $\frac{1}{10}$th of an inch thick; edges slightly excoriated. In the vagina was a little mucus. The thickened and hypertrophied vagina contracts palpably upon the finger. No formed vaginal portion can yet be distinguished; but a long tubular speculum shows the os as a star-shaped and gaping opening. Abdominal tumor gone. Dismissed at request on same day. (Table No. 3.)

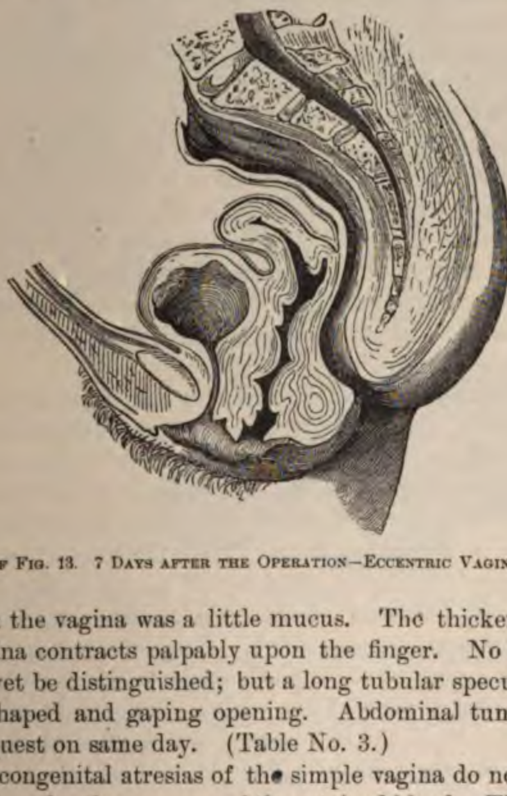

FIG. 14.—CASE OF FIG. 13. 7 DAYS AFTER THE OPERATION—ECCENTRIC VAGINAL HYPERTROPHY.

The other congenital atresias of the simple vagina do not give way and dilate so much under the pressure of the retained blood. Their connective-tissue texture and their thickness enables them to resist; so that dilatation of the lower portions of the vagina and opening of the vulva do not occur. On the contrary, the lower part of the vagina is usually narrow, or cone-shaped, although there may be considerable eccentric hypertrophy of the upper portion. Viewed from below, the atresia sometimes appears flat;

but this is more commonly seen with extensive vaginal defects and atrophy of the uterus, than in circumscribed vaginal atresia. In an exceptional case (comp. Fig. 12), the upper dilated retention-sac appeared like a rounded and enlarged portio vaginalis at the extremity of the blind lower portion of the vagina; and in the specimen the likeness is even more striking, since a central opening has been made.

In a woman of twenty-one, who was married three years, the molimena had lasted a year, and had culminated in the development of a distinct hæmatometra. The vagina ended .6 inch above the well-developed hymen, and formed a blind sac directed somewhat to the left. From the vulva the limiting membrane appeared as a tough, flat, whitish wall, through which fluctuation could be distinctly appreciated when pressure was made upon the abdominal tumor. In two preparations now lying before me, in which there is marked atrophy of the vagina and the uterus, the closure is effected by a tough membrane, in which there are slight furrows to the right and the left.

This form of vaginal closure can be seen by vaginal examination to be of more than membranous consistency; but the thickness of the septum cannot be so determined. Nevertheless it is very important to find this out; and a careful rectal examination must be made for the purpose. The free hand must press the vaginal surface of the septum against the finger, which is in the rectum; and thus an attempt at least at a proximate estimation must be made.[1] A combined vesical and vaginal examination might be made in the same way, but it need only be had recourse to in exceptional instances.

It must not be forgotten, when estimating the height of the atresia, that the lower portion of the vagina may have been considerably enlarged by repeated attempts at cohabitation, examples of which are numerous enough. (Comp. among others, Kussmaul, l. c.) It is worthy of mention that cases have been found in which there were several septa lying one above the other in the vaginal tube. Thus Thompson[2] reports a case of double occlusion of the vagina, deficiency of the upper part (?), and atresia of the orifice, with retention of catarrhal secretion between the layers, while hæmatometra was present above. Charrier mentions a similar case.[3] Steiner[4] records a case from Billroth's clinic in which with a congenital atresia of the upper portion of the vagina, there was an acquired closure at the introitus. It is the only case I know of in which an acquired atresia occurred at the hymen. (Fig. 15.) The patient was eighteen years old, and was said to have fallen with violence upon the pubic region, against a block of wood when two years old. Soon afterwards the mother noticed that the child's external genitals were suppurating; and two years after an abscess, which broke spontaneously, is said to have formed. It was stated that the suppuration continued until the child's twelfth year. From that time to her seventeenth year the girl remained well. Since then molimin. menst. and formation of hæmatometra and hæmatosalpinx. "The examination of the external genitals showed a complete atresia of the vagina by a peculiarly hard, tense hymen containing many cicatricial bands. In its lower portion was an extremely fine opening, into which the smallest sized sound could just be passed. On incision there was first found a blind sac an inch long; it was the rudimenary vagina filled with masses of smegma, and was separated from the blood-retention tumor by a stenosed area half an inch in depth. This was opened under full antiseptic precautions, and a large quantity of tar-like blood evacuated." The patient died on the fifteenth day of septic peritonitis and pleuritis. The tubal blood sacs showed in places some decomposed and ruptured spots.

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[1] Kiwisch and Scanzoni prefer to use the thumb in the vagina and the fore-finger of the same hand in the rectum—and thus to estimate the thickness of the membrane.

[2] Dubl. Hosp. Gaz., June 15, 1856.

[3] Gaz. d. Hôp., 1866, No. 71.

[4] Wien. Med. Wochenschr, 1871, Nos. 29 and 30.

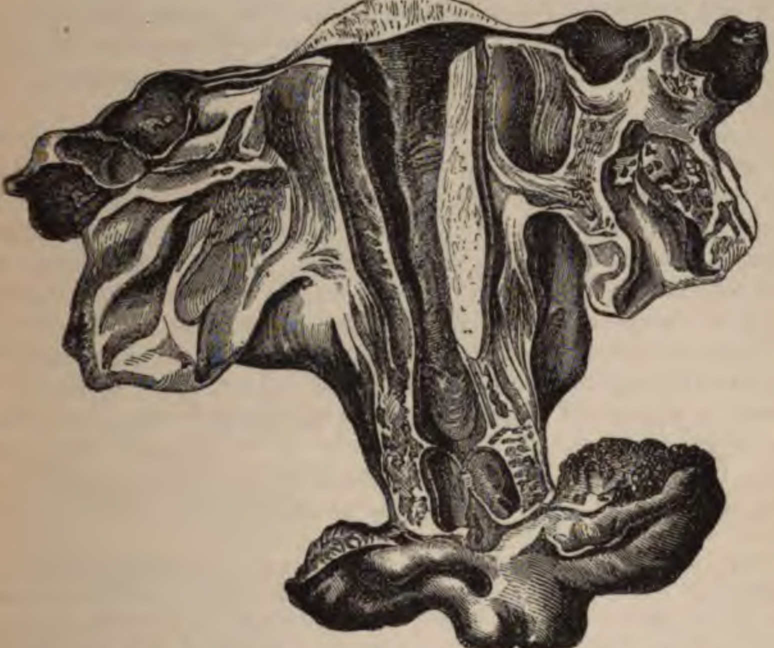

FIG. 15.—FROM A DRAWING OF STEINER'S CASE, KINDLY LENT TO ME BY PROF. BILLROTH.

For differential diagnosis we need only exclude acquired atresias and marked stenoses. In the first case we will find cicatricial bands and an irregular lumen, with traces of inflammatory and ulcerative processes.

But we should remember that irregular cicatrices may not always point to an acquired atresia, but may be the remains of fœtal inflammations. The presence of other developmental anomalies, especially absence of the hymen, may enable us to decide as to the congenital origin of the atresia. The history is valuable, since it will show that the symptoms began at puberty; but it will not always enable us to exclude atresias acquired in early childhood. But it will always give us valuable data in regard to atresias acquired later. Marked stenoses, which occcasionally cause the same retention-symptoms as do the atresias, are much rarer as congenital defects; and acquired stenoses can often be distinguished from the atresias only with difficulty. Sometimes the history of the case is, that, after prolonged retentio mensium, there occurred a sudden evacuation of blood, and the patient was relieved. The lumen must be demonstrated with the sound.

Vaginal atresias with duplexity of the genital canal which have been operated upon for the relief of retention, have so far only been seen unilaterally.[1] They cause hæmatometra and hæmatokolpos lateralis. In a simple vaginal canal they may be seated at the hymen, where, as is by no means always the case, that organ is double. The case that Simon and Veit observed together is of this kind. Much more commonly more or less of the lower end of one half of the vagina is wanting. (Fig. 16.)

Unilateral accumulation of menstrual blood causes molimena ex-retentione to occur together with regular menses, and a tumor to appear at the side of an apparently simple uterus. It was therefore long overlooked, and is even now usually recognized only at the autopsy. Only since about 1860, has the subject been elucidated by the observations of Holst,[2] Veit,[3] and Simon,[4] as also by Schröder's[5] critical studies of the diagnosis of hæmatocele retro-uterina. Since that time the number of cases observed has grown very numerous.[1] Puech (comp. below) has drawn attention to the great preponderance of closure of the right side, finding it in 20 out of 28 cases; and the cases not included by Puech in his lists confirm his conclusions. With rare exceptions the uterus is bicorned to a varying degree in all these cases.

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[1] I know of but a single case in which the anamnesis renders the existence of a bilateral atresia probable. Neudörfer (Diss. inaug. Tübingen, 1873), reports that in R. M., 24 years old, with a fist-sized tumor in the right lower abdominal region, which had appeared in her 16th year, a smaller one formed upon the left side. Both tumors long remained stationary; but from the Fall of 1864, they regularly swelled up and became harder every three weeks, the patient suffering great pain. By May, 1865, the right one was the size of a man's fist, and the left one larger than an apple. There then suddenly occurred a large vaginal hemorrhage, which lasted 14 days. *The left tumor then entirely disappeared, whilst the right one remained unchanged. Two years later, with similar symptoms, there occurred a sudden diminution in the size of the right tumor;* and the symptoms of pyometra and pyokolpos lat. dextr. set in. This history points to bilateral atresia, and to a spontaneous vaginal evacuation of the left hæmatometra, with a rupture of the septum uterinum and evacuation of the contents of the right one into the left half of the uterus.

[2] Beitr. z. Gynäk. u. Geb., part I., Tübingen, 1865, p. 63.

[3] Krankh. d. Weibl. Geschl., 2d ed., Erlangen, 1867.

[4] Monatschrift. f. Geb., vol. 24, p. 292 (Enke), p. 536.

[5] Bonn, 1866.

It is very evident that in this affection also the symptoms will not appear until menstruation sets in. Thereafter they increase with each menstrual epoch. Their regular appearance in youth is a circumstance which Veit has laid stress upon for differential diagnosis.[2] They are exactly analogous to the troubles caused by congenital atresia with simple genital canal, and are due to the development of retention tumors, here characterized by their lateral situation. If the closure is not quite high up in the vagina, the blind sac is driven down, and, though not situated near the vaginal entrance, may cause opening of the vulva and a moderate prolapse of the vagina. Urinary difficulties are comparatively frequent.

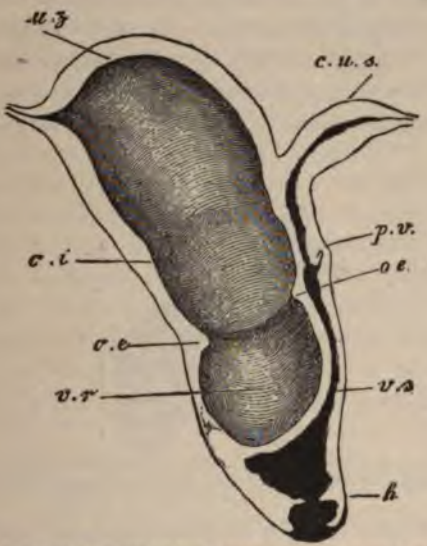

FIG. 16.—SCHEMATIC FRONTAL SECTION OF HÆMATOMETRA AND HÆMATOKOLPOS LAT. DEXTR.—*c. u. d*, Right cornu. *c. u. s*, Left cornu. *o. e*, Orif. ext. *o. i*, Int. of the dilated collum of the right side. *r. v*, Vaginal rudiment in the patent left vagina, forming a blind sac. *v. s*, Distended. *p. v*, Normal left vaginal portion. *h*, Hymen.

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[1] In the first edition of this article, I referred to 46 cases of the kind. Since then I have met with another. (Compare Table No. 15.)

[2] Even in cases which are observed late the beginning of the malady dates back to the commencement of menstruation. If development is late, and the collection of retained blood small, the pains may long remain slight. Holst's patient (Eva Pumberg) began to menstruate in her 27th year, and only came under his care when 42 years old.

Menstruation may remain quite normal in type and quality, though it is sometimes irregular; the complications which occur are due to the accompanying unilateral stasis and catarrh of the patent portion of the uterus and the vagina, and the patients often suffer from leucorrhœa. As noticed in the section upon uterine diseases, the distension of the womb may be very considerable here also; and as Puech points out, rupture of the tubal blood-sacs occurs relatively more frequently here than with simple atresias, it being observed 3 times in 32 cases as against only 25 times in 500 cases of the simple variety. And spontaneous perforation with evacuation into the vagina can more easily occur here than in the latter class of cases. In Puech's 32 cases it was seen 4 times, the perforation always occurring in the septum colli uteri. (Fig. 17.) Two recent cases observed at Tübingen (Neudörffer, Tueffel) belong here.

Unfortunately, however, perforation at this point causes the relief obtained from the hæmatometra to be but a temporary one. The patient remains exposed to the dangers of pyometra and pyokolpos, as I first proved in two cases of my own. This occurred from the appearance of a purulent catarrh of the mucous membrane of the utero-vaginal space. The necessary conditions are a partial stagnation of the retained blood and an imperfect outflow from the small orifice in the septum cerv. ut. Purulent decomposition manifestly begins in the open side. When purulent catarrh has once set in, the retained secretion causes still further dilatation and explains the obstinacy of the process. As the pus accumulates the tumor enlarges; until finally an abundant flow of matter comes from the cervix and the vagina of the patent side. Immediately the patient feels relieved. But the sac soon refills, and the pus in the course of time becomes thin and very foul-smelling. The patient loses flesh from the constant loss, and the attacks of pain and the evacuation of the malodorous pus annoy both the sick woman and her friends. More than this:

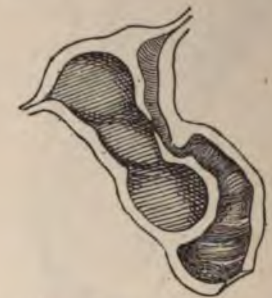

FIG. 17.—SCHEMATIC FRONTAL SECTION OF PYOMETRA AND PYOKOLPOS LAT.

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[1] Arch. f. Gyn., vol 2, p. 84, and Correspondenzblatt für Schweitzer Aerzte, vol. 1, p. 100.

A number of serious dangers threaten the patient from extension of the inflammation to the tube, from ulceration of the diseased mucous membrane, from the development of pelvio-peritonitic abscesses, and from the secondary consequences of these occurrences. The lesions found by Rokitansky[1] and by Wrang[2] *post-mortem* bear out this opinion. Neither case was diagnosed during the patient's life. The latter one occurred in Seyfert's clinic, and Säxinger has lately completed the description of it given by Neudörfer in his dissertation by a careful history. Its entire clinical aspect is that of a pyometra lateralis.

We can only designate the prognosis of cases of hæmatometra and hæmatokolpos, which are left to themselves, as unfavorable, even when spontaneous perforatio septi and evacuation occurs. Pyometra and pyokolpos regularly set in, and bring renewed danger to the patient. These cases, therefore, always require artificial aid.

The diagnosis of unilateral vaginal atresia is connected intimately with that of unilateral hæmato- or pyometra with retention. As Veit remarks, it is not difficult when we once fully appreciate the possibility of the occurrence of the abnormality, and remember that the symptoms are those of hæmatometra with flowing menses. The anamnesis will reveal the characteristic symptom of menstrual colics during the formation of the lateral and vaginal tumor. If there is pyometra and pyokolpos lat., our patients will tell us that after the above-mentioned troubles have been present for some time, there suddenly occurred an evacuation of blood. This gave great relief, but only for a time; new retention pains appeared at the old place, and an abundant purulent genital flow set in. Often they will tell us that considerable quantities of thin foul-smelling pus have been voided from time to time, to their great temporary relief.

The evacuation of the hæmatometra is not always spontaneous; but the conditions of incomplete drainage also occurred in cases where puncture was done.[3]

In a single case of unilateral retention, and one in which hydrometra lateralis was present,[4] there was an entire absence of any history of a previous hæmatometra.

In every case examination reveals a tumor beside the uterus filled with fluid, which projects more or less deeply into the vaginal lumen in accordance with the height of the occluding septum. Often the vaginal portion of the tumor projects forward; and several times the closed half of the genital canal has been seen applied in spiral fashion to the open half. Fluctuation can be felt between the upper and the lower portions of the tumor. If the vaginal portions are unseparated, the os uteri, as Veit remarks, will take a lateral position as regards the tumor, forming an elongated, crescentic opening with its concavity directed to the occluded side. If the tension of the tumor's contents is not too great, the vaginal portion of the tumor will be recognized as being softer than the vaginal portion of the uterus. Often, as I have recently seen renewed proof of in the case Johannowsky has described, we can distinctly appreciate variations in the tension of the vaginal tumor, due to contractions of the sac. After the sac is opened the smooth vaginal portion may be distinguished from the uterus by the ring-shaped os. When the mucous membrane of the exposed sac is scraped with a curette, we can sometimes get epithelium characteristic of vagina or uterus. This I succeeded in demonstrating in two cases in which there was only a short rudiment of the vagina present. The diagnosis will probably be easiest in those cases in which the unilateral atresia is at the vaginal entrance, and in which the cylindrical tumor runs the whole length of the vagina. It will be especially easy when, as in Simon's case, the bloody contents of the tumor can be seen through the transparent sac-wall.

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[1] Zeitschr. d. Ges. d. Aerzte, Wien. 1860, No. 31, p. 481.

[2] Vierteljahrsschrift f. prakt. Heilk., Prag. 1868, vol. 99, p. 39.

[3] Magenau l. c. Braus, Berl. Klin. Wochenschrift, 1874, Nos. 10 and 11.

[4] Arch. f. Gyn. vol. 6, p. 89.

Pyometra and pyokolpos will give us a tumor with the same situation and characteristics; and pressure upon the vaginal tumor will cause pus to appear freely in the vagina from the os if spontaneous perforatio sept. ut. has occurred, and from the puncture or incision if there has been an artificial opening made.

As Schröder has shown, the differential diagnosis of unilateral atresia is chiefly with hæmatocele periuterina; before our more exact clinical knowledge of to-day more than one case of atresia has been confounded with it. (Comp. the section on hæmatocele.) Besides the history, the shape and the location of the tumor, the characters described in the foregoing sections ought to suffice for diagnosis. In high-seated atresias, forming a broad flat tumor, it is not impossible to mistake the affection for a cystic tumor of the ovary or tube attached to the uterus or true pelvis; or even, as I myself once saw, with a large laterally-seated soft myoma. In this last case an exploratory puncture will decide the matter.

The treatment of congenital vaginal atresia only becomes a necessity after puberty has set in, except in those rare cases where the collection of catarrhal secretion within the sac necessitates surgical interference in childhood. Most authorities have rightly held that the demonstration of a blood-retention tumor is a *sine qua non* for the operation; since only when this is made can we be certain of the dilatation of the atresia and decide upon the direction of the incision. We are then sure also of the existence of a uterine cavity above the atresia. These considerations are of the greatest importance. It would be very desirable, if it were possible, to prevent the difficulties and dangers of the condition by a prophylactic operation. At present we can only attempt it in cases of atresia hymenalis. The closed hymen can be recognized without any great accumulation of fluid behind it; it can be drawn down with sharp hooks and then incised. But even in these cases the differentiation of the condition from other deep-seated atresias may be rendered difficult by excessive firmness and thickness of the membrane; and if, in the adult, amenorrhœa is present, so that retentio mensium does not occur, repeated attempts at coitus may so invaginate and displace it as to render its recognition almost impossible. Seyfert demonstrated a case of the latter kind in my presence. But as a rule, there is no question as to the time for interference. The patient does not present herself for examination until violent molimena-menstruatia and blood-stasis symptoms have set in. In fact they rather allow the accumulation to continue as long as they can bear it before seeking aid; and they do not as a rule come under our observation while the accumulation is confined to the utero-vaginal tube, and before the pernicious tubal blood sac with its pseudo-membranous adhesions, have been formed.

In every case the indication is to open the sac, and keep it so; so that a free evacuation of the retained contents may be secured and the functional activity of the genital system be restored. Unfortunately we can only completely fill the indication in exceptional cases, when the genital canal is a simple one and a thin septum and atresia hymenalis is present. In other cases it is rarely possible, although we may obtain fair results. In unilateral atresia the prospects of establishing a permanent opening by surgical means are better.

As is well known, the dangers attendant upon operation in these cases are by no means slight. Many examples show us that not only operations upon difficult cases with extensive defects of tissue, but simple measures in thin-walled and superficial atresias may lead to most fatal results. The correctness of the warnings which Dupuytren, Labatier, Cazeaux and others have given us in regard to these operations have been proven by the fatal cases which have occurred in the practice of such experienced surgeons as Langenbeck, Schuh, Nélaton, Billroth, cte.

The dangers of the operation are:

1. Injuries to neighboring organs. (Bladder, rectum, peritoneum.
2. Rupture of tubes distended with blood.
3. Septic infection.

The first danger is one which is only present when broad atresias causing considerable technical difficulties, are to be operated upon. The second and third, however, are present in all varieties. We will proceed to a more detailed consideration of these points.

In large defects and atresias of the vagina, where there is not simply an adhesion, but a connective-tissue obliteration of the lumen of the canal, a bloodless dilatation is out of the question, and injuries to the bladder and rectum can easily occur, and have been repeatedly done. To avoid them Emmet[1] advises that after opening the dome of the blind sac with knife or scissors, a blunt instrument, a finger or the handle of the scalpel, is to be forced into the sac to enlarge the opening. While the atresia is being divided the bladder must be protected by a catheter, and the rectum by a finger introduced into it. Or the finger of the operator may be passed into the bladder, while an assistant may place his finger in the rectum. This is necessary even when the apex of the retention-tumor can be attained without the preliminary division of an atresiad stretch of tissue; since the bladder has been injured by the direct puncture of a trocar.[2] Where cutting instruments are used there may be considerable hemorrhage, as occurred in one of Hildebrandt's cases,[3] and tamponade may be necessary when irrigation, ice, etc., fail to control it.

Nevertheless a bad result even in cases of broad atresia occurs less frequently from operative injuries than from rupture of the tube or septic infection. The former accident has especially attracted the attention of surgeons. To Rose belongs the credit of having demonstrated its importance by the collection of numerous cases which have been verified by *post-mortem* examination.[4] The connective-tissue adhesions of the dilated tube to neighboring organs, especially to the parietal peritoneum, are of importance for the correct understanding of the mode of origin of these tears. They have been observed among others by G. Gosselin,[5] and recently, in Winckel's case,[6] by Birch-Hirschfeld. They are also to be seen in two preparations of the Prague collection, in which tubal rupture occurred after the operation for hæmatometra. The diminution in size and the change of position which occur in the uterus and the portion of the vagina above the atresia, after the evacuation of the hæmatometra, cannot be followed by the adherent tubal sac; and the sudden contraction of the emptied tumor and the increased pressure from the abdominal walls, to which it is subjected, causes a rupture of the thin walls of the sac. In addition to this Näcke lays stress upon the sudden diminution of the pressure to which the tubal sac is subjected; which is especially to be feared when the hæmatometra is large.[7] The uterine contractions, to which attention was directed by the older authors, and to which the preponderating influence in the occurrence of rupture has been ascribed more recently by Steiner, Billroth,[1] and Freund,[2] may act in one of three ways. It may directly express the uterine contents into the tube. This, however, can only occur in those rare cases where the ostium uterinum is much dilated. I know of but a single case of the kind, which has just been described in a foot-note. Then rupture from a sudden and considerable increase of pressure in the tubal sac may occur from the propagation of uterine contractions into the tubes. It is not probable, however, that the chief cause of the occurrence is to be found here; for violent contractions may have been present before operation without causing rupture, and rupture may occur without any specially noteworthy contractions. Finally, contractions of the uterus and of the hypertrophied portions of the vagina may directly increase the tension to which the tube is already subjected by the changes in position and diminution in size of the emptied organs. This latter seems to be an important factor in influencing rupture. Nevertheless it is not to be regarded as alone responsible, since important and sudden increases of pressure may spring from other causes, such as the action of abdominal pressure. It seems to me that the tension upon the adherent tubal sac in consequence of the change in size and position of the evacuated organ, is the most important purely mechanical factor in causing tubal rupture. It hardly needs to be mentioned that in the times when the anatomical relations of the tubes in hæmatometra were less thoroughly appreciated than they are now, accidental external pressure upon the tumor or upon the abdominal walls may have determined a rupture.

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[1] New York Med. Rec., ii. No. 26, p. 35.

[2] In the Prague collection is a preparation showing a bladder injured by such a puncture, with consecutive septic phlegmon of the pelvic connective-tissue. It is especially interesting, inasmuch as it is complicated with a colossal right-sided tubal dilatation, equaling the moderately filled large intestine in size. Rupture did not occur. The ostium internum of this tube was relatively very large, mitting a thick sound; whilst the ost. abdom. was closed by adhesions.

[3] Comp. Krause's Dissert. l. c.

[4] Monatschrift f. Geb., vol. 29, p. 401.

[5] Gazette des Hôp. 1867, No. 57, p. 225.

[6] Näcke, Arch. f. Gyn., vol. 9, p. 471.

[7] Näcke's idea, that the sinking of the pressure in the true pelvis is a factor in

While it may not always be possible to avoid this danger, the recognition of its importance will always contribute to the safety of the operation. Therefore Puech, Rose, and others advise above all that the operation be done as speedily as possible. This depends, however, as we have said, more upon the patient than upon the surgeon. It is important also to operate at the middle time between two menstrual epochs, so as to avoid encountering a renewed increase of volume of the retention tumor

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the occurrence of rupture of the tube, has wrongly been denied by Rennert (Centralbl. f. Gyn., 1882, p. 40). The incompressibility of the fluid contents of the sac does not cause, as Rennert believes, an equal pressure upon all portions of the sac, so that the diminution of external pressure can have no special influence upon any one part of it. The incompressible fluid is comparable to the liquor amnii, and like it is enclosed within distensible walls. If the external pressure upon one part of the sac is diminished, the fluid contents will be displaced, and the walls of the sac be ballooned out in the direction of least resistance, and may be made so tense as to rupture. On the conditions influencing such pressure changes in the true pelvis, comp. p. 40.

[1] L. c.

[2] Zeitschrift. f. Geb. u. Gyn., vol. 1, part 2, p. 247, Stuttgart, 1877.

from the menstrual flow. During evacuation, not only must all external pressure be avoided, but the abdominal pressure must be removed. This latter result is to be obtained by skilfully conducted and complete anæsthesia.[1]

Much stress has been laid upon the importance of gradually emptying the tumor with a trocar, or by means of repeated aspiration with a canula or a Dieulafoy aspirator. But few cases have terminated favorably when this method was employed; and the unfavorable ones show us that the possible ill consequences of the operation are not to be averted in this way.

Though the plan appears to be a rational one, it is an unfortunate fact that with incomplete evacuation the dangers of septic infection are increased. If septic infection does occur, the dangers of a secondary rupture of the tubal sac are much greater, since the septic tissue-changes largely increase the friability of its walls; and the ulceration caused externally by pelvio-peritonitic abscesses may also lead to a solution of continuity. It is my opinion that no small proportion of the cases of tubal rupture have occurred in exactly this way; and I believe that Spiegelberg is right when, as reported by Elischer,[2] he classifies a number of Rose's cases of tubal rupture under the heading of septic infection. Here also, I think, belongs the above-mentioned and extremely interesting case of Billroth-Steiner. For the sudden collapse to be looked for in tubal rupture was absent, and the peritonitic symptoms first appeared accompanied with high fever upon the evening of the third day Chills, pleurisy, a foul-smelling genital discharge, and an erysipelas beginning at the genitals, followed. The autopsy showed that besides the septic exudates which were found mixed with blood in the true pelvis, there were several small openings into the tubal sac, the tissue around which was in a state of decomposition.

If many cases of tubal rupture are dependent simply upon septic infection, we are entitled to hope that with a more thorough prophylactic antisepsis many of these patients may be saved.

It would certainly be proper during the operation to take care that the retained blood be gradually evacuated, so as to avoid any sudden alteration in the contents or position of the pelvic organs, and prevent a too rapid change of pressure. This must not prevent our fulfilling the antiseptic indication which demands that there be a free outflow of the retained blood. It has been sought to accomplish this by operating at two different times, the first time puncturing with trocar or exploring needle, and the other time doing the incision. The operation should under all circumstances be done at one sitting, and a sufficiently free opening be made at once. We can provide for a slow outflow by allowing the thickened fluid to run out slowly through the preliminary puncture (see below) before making the freer incision. A few minutes are enough to allow a gradual adaptation of the pelvic organs to the altered relations. In seven cases of hæmatometra, with broad atresia, I was compelled to operate in two cases where a unilateral tubal sac had been diagnosed; yet no evil results followed from the operation. I thoroughly agree with Emmet in that the most important point in the unilateral operation is to establish a free outflow; and I attribute our good results very largely to our appreciation of this fact. (Comp. table.)

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[1] Kaltenbach's objection that vomiting may occur during the anæsthesia and cause rupture is an important one, but is not weighty enough to lead me to reject narcosis. If the patient's stomach is empty and a pure chloroform is used, vomiting will but rarely occur *during* the operation in the youthful and generally healthy patients in which the affection occurs. Later vomiting is not of so much importance. I have never seen any evil results from the anæsthesia.

[2] Berl. Klin. Wochenschrift, 1876, No. 30.

Rennert[1] recommends that we distend the vaginal canal by permanent irrigation during the operation, and for a few days afterwards, so as to prevent a too rapid change of position of the pelvic organs.

We have no recorded cases to show whether this idea of Rennert's would really render an adherent tubal sac less dangerous, since the case of hymenal or retro-hymenal atresia in which he used it, was not complicated with hæmatosalpinx.

But not even all these precautions will avert all the dangers of a tubal blood sac. And it may be proper in some cases of hæmatosalpinx to do laparotomy and extirpate the tumor, or, if that is impossible, to practise incision and drainage. In both cases the laparotomy operation must precede the atresia operation, and in the latter the tubal sac must be stitched to the abdominal walls before the incision is made.[2]

The third danger in the operation for vaginal atresia is that of septic infection, which has caused death in many cases with symptoms exactly like those of puerperal fever. Several gynecologists have preferred to divide the atresia with the thermo-cautery, thinking to protect the surface of the wound from infection by the eschar more thoroughly than by means of the ordinary antiseptic measures. It is very evident that this could only be done with very accessible or narrow atresias, such as atresia hymenalis or retro-hymenalis (M. Duncan[3]), or with lateral hæmatokolpos (Neugebauer). For in cases where the guidance of the fingers is indispensable, and where we work in the immediate vicinity of bladder, rectum, and peritoneum, some instrument which is not red hot must be employed. In suitable cases the method has been successful enough; but according to my experience, we can dispense with it entirely. The electrolytic action of the constant current has also been tried. Lefort[1] reports that he thus succeeded in making an artificial passage through a vaginal atresia, on which ten previous operations had been tried in vain. He passed a copper wire into the funnel-shaped blind sac, which was 1½ inches long, and applied the constant current. He says that menstruation thereupon appeared regularly, the speculum could be introduced, and the portio seen. Several of the older observers thought that the entrance of air and the decomposition of the retained blood was the cause of the infection. Vidal[2] claimed as the cause of the entrance of air the previous dilatation of the uterus, which was then unable to close. Scanzoni also calls attention to the danger of a septic endometritis, caused by the entrance of air; Clarke,[3] who believes that rupture of the tubes is caused by ulceration, fears the entrance of air, lest it start up the destructive process, and seeks to prevent it by the exhibition of secale and turpentine. It is undeniable that the decomposition of the stagnating menstrual blood which is left behind, is much more often the cause of septic endometritis and pelvioperitonitis than is the direct infection of the wound during the operation; explainable perhaps in that the bacteria find a very suitable nutriment in the decomposing semi-fluid matter. Infection during and after the operation will be avoided by the general care in regard to the minute cleanliness of instruments and of the fingers which is now the rule. When it is necessary we may disinfect the entire seat of operation, use the spray, and avoid all untrustworthy dressings; and afterwards frequently change the dressings after having steeped them in an antiseptic fluid.

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[1] Centralbl. f. Gyn., 1882, p. 40.

[2] Schröder (Zeitschrift f. Geb. u. Gyn., vol. 8, p. 202), extirpated the blood-distended left tube in a case of unilateral hæmatometra. The patient recovered, and spontaneous rupture of the hæmatometra into the vagina occurred. The orifice had to be dilated later.

[3] Obst. trans. London, 1882, p. 212.

As to the entrance of air into the retention-cavity, later experience has shown us that its danger depends upon whether it has been disinfected or not; the contact of even hospital air, which has been made aseptic by means of a carbolic or salicylic spray, being innocuous. Nevertheless, it is advisable in places where an efficient drainage is difficult to obtain, to prevent the entrance of air as much as possible. M. Sims, Schatz, and Hegar have studied the conditions upon which depend the entrance of air. Schatz has especially made it clear that the pressure-relations within the pelvis, whether the patient be in the knee-elbow, in Sims's, or in any other position, is changed as soon as any organs which occupy the true pelvis are lifted out of it. Since the bony walls will not give way, as soon as the pressure sinks below that of the atmosphere air will enter if allowed to. When the elevated and dilated organs, the uterus and the vagina, cannot sink down *en masse* after evacuation, so as to prevent a negative pressure in the pelvis, air will rush in through the gaping wound.

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[1] Ann. d. Gyn., Tome vi., Sept. 1876, p. 206: Création d'un vagin artificiel par l'électrolyse.

[2] Bardeleben, Lehrb. d. Chir., vol. 4.

[3] Brit. Med. Journ., Dec. 1865.

This may occur by any operation, but is especially liable to happen when we use the trocar and canula. In fact the change in shape and position of the emptying sac is often an insufficient one; and this on account not only of the pseudo-membranous fixation of the uterus and tubes, but perhaps oftener because of the hypertrophy and dilatation of the collum uteri, and that portion of the vagina which lies above the atresia.

It is, therefore, advisable not to elevate the patient's pelvis too much; and in narrow, septum-like atresias not to keep the orifice open with the knife, until the pressure of the fluid has sunken so that it ceases to flow. We cannot make use of the ordinary measures to prevent the entrance of air when puncturing, because we do not employ the simple puncture with the trocar. When it is absolutely necessary, as in broad atresias, to leave the canula *in situ*, we must use antiseptic injections and see that there is a free outflow; for the entrance of air and the decomposition of the secretion which is left behind is unavoidable. At least we should attempt to disinfect the entering air as much as possible, by packing the end of the canula in disinfectant absorbent cotton or gauze; or, if short canulæ which do not project from the vagina are employed, closing the external genitals with an antiseptic pad. We have often used compresses soaked in dilute chlorine water for this purpose.

At least as important as the above-mentioned precautions during the operation, is the prevention of the entrance of air after the operation. We must especially avoid any manipulations which would cause the vaginal canal to gape, such as digital or specular explorations, the introduction of sounds, etc. Attempts to do these things have caused the ill-success of operations which had otherwise turned out well, and in cases in which all danger was supposed to be over. I called attention to this point some time ago,[1] and Elischer[2] has since then published certain cases of Spiegelberg which show its importance.

Since the entering air does most harm when abundant stagnating secretion is present, it is extremely desirable to obtain as thorough an outflow of the contents of the tumor as is possible. For this reason I must sustain Puech in his criticism of the process recommended by Scanzoni[3] and Baker-Brown, to puncture through the rectum. In favorable cases it palliates the trouble for a time; but our experience is hardly sufficient as yet upon this point.

It is difficult to say whether Simon's idea to open the sac from the bladder can be successfully accomplished. W. Krause in his dissertation (Marburg, 1872) recommends it. It would possess the advantage that no foul gases would enter the sac, and the menstrual blood could flow off perfectly well through the bladder, if the fistula is only large enough.

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[1] Progr. Med. Wochenschr., 1876, No. 7.

[2] Berl. Kl. Wochenschr., 1876, No. 30.

[3] Dis. of the female sexual organs, 5th ed. 1875, p. 646.

We see this in successful cases of vaginal obliteration. But the same objection which has recently led many surgeons to reject Simon's transverse obliteration would apply here. It would occasionally lead to cystitis and pylonephritis, and sometimes give rise to vesical concrements.

It has been recommended for the purpose of avoiding septic infection to wash out the retention-sac, and thus get rid of all the blood immediately after the operation. Emmet is the most prominent advocate of this proceeding, and lays especial stress upon the use of very hot water for the purpose. Others use disinfecting fluids.

In our experience the washing out of the sac is only necessary when the evacuated fluid is already in a state of decomposition. Under ordinary circumstances antiseptic injections are only necessary later, when the pressure in the sac has so far sunk that no more blood flows out, and the vaginal secretions easily undergo decomposition, or when air has entered into the sac through the canula. The indications for injections are rarely present before the second or third day. Not only is it not necessary to use injections immediately after each operation; but to do so would interfere with the measures which have been recommended to prevent rupture of a hæmatosalpinx. If there is no hæmatosalpinx, irrigation will certainly do no harm.

In considering its dangers, we have described most of the steps of the operation, and there only remain a few special points to be described.

In hymenal atresia, where an opening can most easily be made, the old method of cruciform incision recommended by Celsus fulfills all the indications. Only when we find a lateral tubal blood tumor, are the above precautions in regard to free outflow, etc., necessary. Baker-Brown's[1] practice of ablating the hymen all the way round, and the recommendation of Vidal and Böckel, to encircle the margins of the wound with stitches after excision, are unnecessary complications in any case save when the hymen is exceptionally fleshy.

In atresias, where the lower blind sac does not end in a projection covered by smooth mucous membrane, an attempt at bloodless dilatation may be made with the finger or a straight metallic catheter. In some few cases astonishing results have been attained in this way. Thus in Amussat's[2] well-known case, a total vaginal occlusion in a girl fifteen years old was rendered patent by simple digital pressure, and the continuous use of sponge tents, so that eventually the collum could be incised and the retained menstrual blood evacuated. Two years later the patient was perfectly well. In a similar way Gantvoort[3] obtained a permanently good result in a girl fourteen years old, in whom there was supposed to be an entire absence of the vagina. Bidder[1] also succeeded with his finger in opening the apparently absent vagina in a girl seventeen years old suffering from hæmatometra, so that puncture of the collum could be done, and the patient relieved, although a vaginal stenosis remained behind.

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[1] On Surg. Dis. of Wom., 2d ed., Lond. 1861, p. 229.

[2] Gaz. Méd., 12 Dec. 1835.

[3] Nederl. Arch. f. Genees. u. Naturh., 1866, vol. 3, p. 380.

There is no doubt that in these cases there was no real defect or cicatricial stenosis, but rather a firm adhesion of the vaginal walls to one another. Veit has claimed that this was the fact in Amussat's case; and this not so much because the membrane covering the atresia offered so little resistance as because the right passage to the portio vag. was so quickly found and so easily kept open. Since it is impossible before attempting dilatation, to distinguish these adhesions from real obliterations, it would be well before proceeding to operate to make an attempt to force a passage in this way.

If the atresia is covered with a smooth mucous membrane, or if the attempt to effect a passage with the finger has failed, we now proceed to split the mucous membrane with scissors or knife, bearing in mind the precautions recommended above. Then we make our way with a blunt instrument through the deeper layers of tissue towards the tumor, while an assistant with a metallic catheter controls the urethra and the bladder, and with his finger guards the rectum. The finger, aided occasionally by a blunt closed pair of scissors, is the best instrument that we can employ. If bands of firm tissue are met with, they may be divided with the latter instrument.[2] When we thus reach the fluctuating wall of the retention-tumor, we must palpate carefully to decide whether we cannot distinguish the region of the cervix as a soft, depressible round spot in its walls. This is often the case when only a small remnant of the fornix division of the vagina is preserved above the atresia. It cannot be felt, of course, when the lower portion of the tumor is formed of a large section of vagina, and is tense. I have repeatedly succeeded in finding it, and have experienced its usefulness in facilitating future utero-vaginal communication; since it is only when the place is properly selected that the cervix assumes its position in the lumen of the vagina. I use a long-handled lancet-shaped knife, to effect the opening, either at the site of the cervix, or, if it cannot be found, at the lowest part of the vault of the tumor; the blade being protected by a large canula controlled by a spring. (Fig. 19, *f*.) Drawn back into the canula, and thus guarded, the knife may be safely passed under guidance of the finger to the selected spot, and applied to it. The blade is then projected until it enters the retention tumor; and then the puncture is enlarged to right and left with the knife. The opening should be about ⅕th of an inch broad. Then the blade is withdrawn into the canula, the knife removed entirely, and the canula pushed deep into the tumor. I then use the instrument which I call my forceps canula. (Fig. 18.) It consists in principle of a canula split into two halves, to which a strong, double curved dilatation forceps has been added. This instrument is passed over the canula, which it exactly fits, and is pushed closed into the retention sac. Now the jaws of the forceps-canula are forcibly opened, and they are fixed by means of the catch. Immediately after incision the thickened blood begins to flow out; but after the wound is dilated it appears in larger quantity. By dilating slowly, the rapidity of outflow may be controlled, and the disturbing influence upon the position of the pelvic organs be more gradually brought to bear. The advantages of this course have been fully described

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[1] Berl. Klin. Wochenschr., 1874, No. 46.

[2] Emmet's rule, to make the division with the blunt instrument as large as possible, so as to obtain a wide passage, is only to be followed with great caution. Too extensive lateral movements of the finger injure the pelvic connective tissue needlessly, and if the course of the wound is not a thoroughly aseptic one, favor the occurrence of extensive phlegmona pelvica. (Compare Table No. 10.)

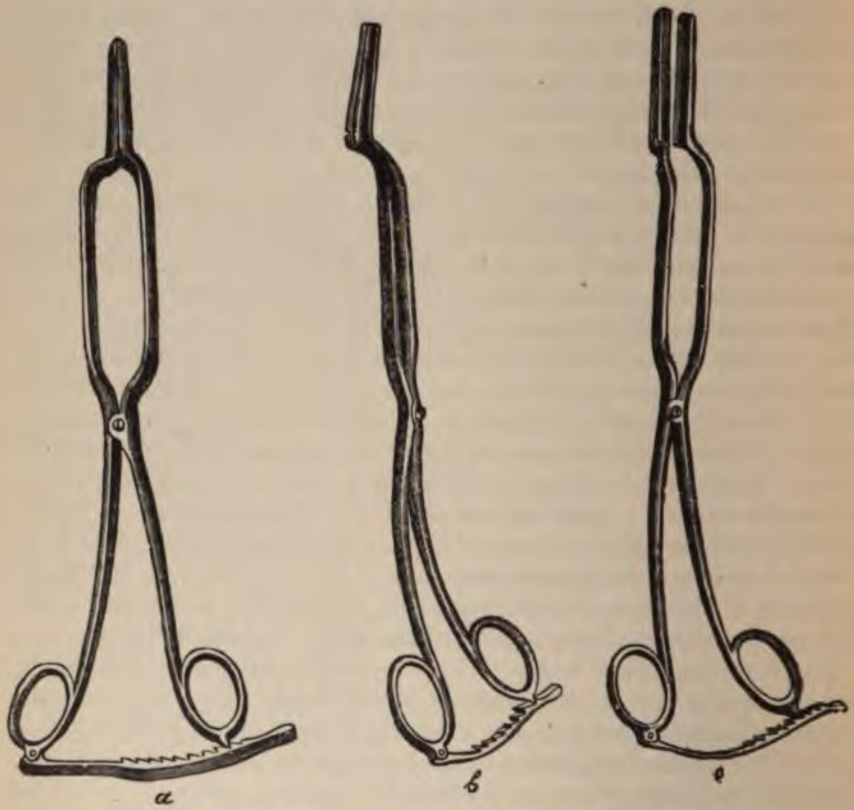

FIG. 18.—*a*, *b*, *c*, Forceps Canula; closed in *a* and *b*, open in *c*.

above; and we may thus prevent the danger of rupture when hæmatosalpinx is present, while retaining the advantages of complete dilatation at one sitting. As soon as dilatation is complete, a fenestrated double tube of German silver, about 2½ inches long, is introduced between the jaws of the forceps canula; thus ensuring free outflow and enabling us to make antiseptic injections. This tube has an olive-shaped end, at the apex of which is the opening of the canals.[1] The olive end is bent at an obtuse angle to the axis of the tube; and the whole very much resembles a Dutch clay pipe, so that we usually call it the pipe-canula. (Fig. 19, *d*, *e*.) For introduction, and to facilitate future washing through it, a tube of German silver about six inches long can be put into the lower opening of the olive. This can be done easily with the guidance of the fingers. When the double canula has been introduced, the forceps canula may be withdrawn, the former instrument being left *in situ*. The bulb protects the mouths of the tubes from vaginal pressure, and its larger volume tends to dilate the atresiad spot. A few days later, when the uterus has contracted considerably, the tube may be replaced by a thinner one not over 2½ inches long. It may be left in place for a considerable time, though of course it should be cleaned occasionally.

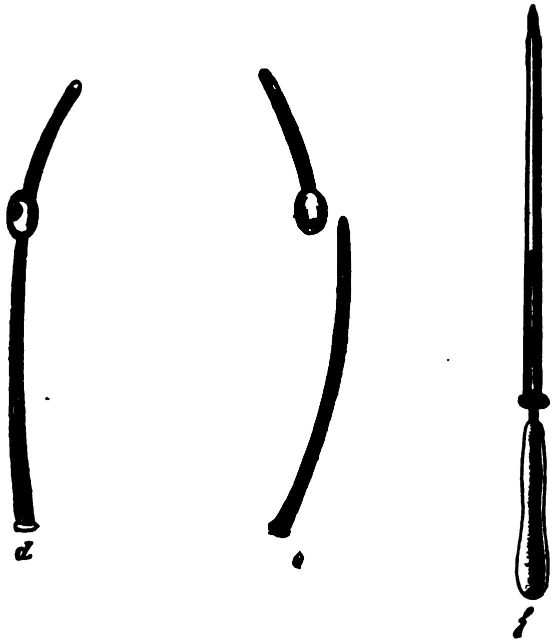

FIG. 19.—*d*, *e*, Short, pipe-shaped double canula, at *d* with extra tube attached, at *e* with it withdrawn. *f*, Trocar-knife.

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[1] I have lately had the "dead end" of the double canula, like those of the metallic catheters, covered with tin.

This method is the only one that I have used since 1878; it has done me good service in seven cases of broad atresias. But other methods will do as well; and the operation depends much less upon the instruments used than upon the appreciation of the correct principles which should guide it. But from the peculiar difficulties offered by a field of operation where we must rely upon the touch, it is desirable to render the technical difficulties as small as possible by the use of suitable instruments.

As regards the tubes used in broad-seated atresias, their purpose is not to dilate the stenosed region, but to maintain the communication between the uterus and the vagina, and to provide for outflow and for antiseptic injections. To accomplish its object, the tube must partially lie in the cervix itself when the atresia is high up and near the uterus. In these cases it is important that the tube be not too large, since it would otherwise interfere with the involution of the portio. The portion that lies in the atresia should be somewhat thicker. I have endeavored to accomplish this with the clay-pipe canula.

If there is a considerable portion of vagina above the atresia, we need not be so careful, and any incompressible tube will answer our purpose. It may then be thicker in calibre, and must of course be provided with a number of not too small openings for purposes of drainage and irrigation. Drainage tubes of hard rubber, German silver, or glass, have not done well; the small orifices in them soon becoming clogged.

If we have a small, membranous and vaulted atresia to deal with, we shall choose our instrument in accordance with its accessibility. bearing in mind what we have already stated as regards the advantages of a free incision. The higher we have to operate, the more necessary will it be for us to use canula-protected instruments; for which purpose the above-described instrument is to be recommended. It cannot be done so well with the "dilating trocar" which Clinton Cushing[1] has described, while Bixby's double trocar and the ordinary trocar do not allow a sufficiently free outflow, and, being difficult of access, render subsequent dilatation very inconvenient. In unilateral vaginal atresias the knife and scissors can always be used. With the aid of the duck-bill speculum, a puncture can be made into the vaginal septum, and then the entire partition be split with curved scissors or probe-pointed bistoury.[2] Veit and Freund recommend the excision of a piece of the septum; but I do not see that it has any advantages over the simple incision, which I have done five times.

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[1] St. Francisco Western Lancet, vol. xii. No. 11, 1883. On the treatment of pelvic abscess. Cl. Cushing's instrument consists of a slightly curved forceps, on compression of the ring-shaped handles of which the leaves which form a trocar in the closed state are separated.

[2] A new instrument for the ready and effective use of the double current in the treatment of suppurating cavities and pelvic drainage. Bost. Med. & Surg. Journ., 18 Nov. 1875.

As to after-treatment, in addition to the precautions already mentioned in regard to the prevention of the entrance of air and the stagnation of secretion, it has been recommended by many surgeons to apply a compression bandage to the abdomen.[1] I do not think its use will be of much avail either in favoring complete evacuation or in preventing rupture of the sac; and the necessary pelvic movements which the patient must make while it is being applied, might not be wholly harmless. It will be better, therefore, not to employ it save in cases where the tumor is very extensive. Here it may be useful in enabling us to apply an even external pressure to replace the diminished intra-abdominal pressure, and to immobilize the lower abdomen. Even here, however, it will be simpler to apply a linen bandage over a few layers of absorbent cotton.

It is of the greatest importance to maintain a free outflow from the tumor, and to prevent the closure of the vaginal passage. If the atresia is of small extent, and the incision sufficiently large, it will not be necessary to take any special measures to secure this. But if the new passage is broad, or long, the maintenance of its patency will be the most difficult part of the after-treatment. The extreme tendency to contraction during cicatrization unfortunately but too frequently interferes with the success of our efforts.

Various means have been employed to overcome this tendency.

1. By wearing or introducing glass tubes (M. Sims, Emmet). In this way cicatrization is said to occur throughout the dilated tube. A number of successful cases have been recorded by the American gynecologists; but instances of non-success are not wanting, though they are ascribed to the neglect or the carelessness of the patients. The method is open to the objection that it readily causes decubitus. Indeed Galabin[2] saw the pressure of a Sim's dilator twice cause an opening into the bladder, in a girl eighteen years old. And it hardly seems proper to accustom young girls to these manipulations, which can scarcely be accomplished without disagreeable secondary consequences.

2. By repeated dilatation with finger and speculum. This procedure, if done without anæsthesia, is quite painful, and if done at first every two or three days, and later less often, it is not liable to irritate the sexual nerves. It may not be out of place to mention expressly that the manipulation is not to be begun until the uterine cavity is entirely free from secretion, and the surface of the wound is everywhere covered with granulations; thus ensuring some safety against the dangers of infection. Until that time, about eight days, we must rely upon the canulæ to maintain the calibre of the canal.

3. By covering the surface of the new passage with mucous membrane

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[1] Comp. Hegar and Kaltenbach, Oper. Gynæc., 2d ed. Stuttgart, 1881, pp. 566 et seq.

[2] Obst. Trans. London, 1880, p. 257.

or integument. Thus Heppner[1] proposed in 1872 to make an H-shaped incision into the skin, and thus to form skin flaps which could be sewn into the newly-formed vagina.

Without knowing anything of Heppner's process, B. Credé[2] took from the left labium majus a piece of skin 2.4 inches broad and 4.8 inches long, leaving it attached to the perineum. With this he covered the wound, putting the apex towards the cervix, and stitching the edges to the borders of the mucous membrane. The patient was a virgin fifty years old, and had suffered from a high grade of acquired vaginal stenosis, which Credé had incised and then had dilated with a blunt instrument. The vagina was tamponed with iodoform gauze after the operation, and a catheter was allowed to remain in the bladder for five days. Three-fourths of the wound healed prima int., the rest by granulation. The vagina remained enlarged, the hair of the flap causing no disturbance.

A. Martin,[3] who always sews the mucous membrane of the atresiad cavity to the external skin or the nearest sound mucous membrane, uses the vaginal mucous membrane to cover the canal in deep-seated atresias, suturing the mucous membrane of the cavity to it. Nevertheless he reports a case in which a marked cicatricial stenosis appeared.[4] Braithwaite attempts by the transplantation of one or two strips of mucous membrane from each side of the vulva to counteract the tendency of the newly-established passage to close up.

It will readily be seen that the stitching of flaps of mucous membrane or skin into the new tract requires a field of operation freer than will usually be found available. If it can be done, it of course affords protection against complete obliteration, though probably not against stenosis. At least Martin's observation would show this to be the case.

I have always employed the second of the three methods above described, that of periodic dilatation, as soon as the canula first introduced has been *in situ* long enough. In two out of seven cases of broad atresia, I have observed a complete cure without noticeable stenosis after one or more years; two fingers or a medium-sized speculum being easily introduced in either case. Of the remaining five cases, four were not seen after primary healing had occurred, while in the fifth a marked stenosis reappeared, though menstruation was not interfered with, and the general health remained good.

Of course the result depends largely upon the extent of the atresia, and the amount of new connective tissue which is formed after the operation. The first condition is indeed beyond our control; but we may perhaps be able to limit the scar by attempting to secure a completely aseptic course for the operative wound. Where suppuration occurs, extensive strata of the surrounding tissues will become transformed into cicatricial masses.

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[1] St. Petersb. Med. Wochenschr., 1872, pt. 6, p. 552. I only know it from Schröder's handbook.

[2] Arch. f. Gyn., 1884, vol. 22, p. 229.

[3] Path. u. Ther. d. Frauenkrankheiten, Wien. u. Leipzig, p. 54 et seq.

[4] Obst. Trans., Lond. 1880, p. 259.

The table on succeeding pages gives the results of the cases which I have operated upon in accordance with the above principles.

Congenital vaginal stenoses are less dangerous to life than are the atresias. They cause no permanent retentio mensium, and only when the stricture is very tight do they lead to a temporary retention. These temporary retentions are overcome by the uterine and vaginal contractions from time to time, marked dysmenorrhœal symptoms being present. The less the stenosis, and the nearer to the introitus vaginæ it is located, the less prominent will be the symptoms of irregular menstruation. Thus vaginal stenoses are generally brought to our notice as obstacles to intercourse and to childbirth.

They may occur at the hymen as a narrow opening of that membrane, or in the lumen of the vaginal canal. In the latter case we find at one or more, rarely at several places, contractions, usually of small breadth; and we perceive that the vagina is narrowed by prominent transverse or spiral ring-shaped folds. The broader stenoses are usually acquired; but there are some instances of broad congenital stenoses on record.

As is the case with atresia, the cause of congenital vaginal stenoses is to be sought in fœtal inflammatory processes. They probably most often occur during the later period of intra-uterine development, for in the earlier ones the smaller width and less abundant epithelial desquamation offer more favorable conditions for total obliteration. Hymenal stenosis, hymen with only a small orifice, has a different origin; as with the imperforate hymen, it is due to the rapid growth and too extensive union of the hymenal folds. Although a number of them have been recorded, the hymenal are among the rarer of the partial congenital strictures. This is probably partly due to the fact that they only come under observation when they form an obstacle to coitus, or in the rare cases in which pregnancy has occurred with a persistent hymen. G. Braun[1] has recently given us the history of two such cases. I myself recently had occasion to see a woman twenty-two years old, and pregnant for the first time, in whose distensible and skin-like hymen there was only a central opening into which a uterine sound could just be passed. The elasticity might of course be partly due to the softening consequent upon her pregnant condition. During the delivery the hymen became very tense, and was incised. In cases of hyperæsthesia of the vaginal entrance, and of vaginismus, I have seen hymenal stenosis a few times in young women; but the membrane was always very tough and resistent; and this, as is well known, would be alone sufficient to be an obstinate hindrance to cohabitation, and form the starting-point of a vaginismus.

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[1] Wien. Med. Wochenschr., 1876, No. 13 and 14.

LIST OF CASES OF VAGINAL ATRESIA OPERATED UPON BY THE AUTHOR.

No.	Variety of Atresia.	Age.	Duration of Molimena.	Retention sac.	Hæmato-salpinx.	Date of Operation.	Result.	REMARKS.
1.	Hymenalis.	New born.	—	Vaginal.	—	December 1878.	Cure.	—
2.	Hymenalis.	17 years.	6 months.	Vaginal.	—	May 1875.	Cure.	40 ounces. Eccentric hypertrophy of vagina; hypertrophic hymen.
3.	Hymenalis.	17 years.	3 months.	Vaginal and cervical.	—	December 1875.	Cure.	46 ounces. Eccentric hypertrophy of vagina; hypertrophic hymen.
4.	Hymenalis.	14 years.	2 months.	Vaginal.	—	January 1880.	Cure.	—
5.	Hymenalis.	19 years.	No pronounced molimena.	Vaginal.	—	February 1885.	Cure.	Imperforate hymen septus with their places near the median columns, the left having probably been perforated by the sound. Decomposition of the retained blood. Fever on reception. Eccentric hypertrophy of the vagina. Recent endokolpitis septica.
6.	Hymenalis.	18 years.	2 years.	Vaginal and cervical.	—	March 1885.	Cure.	Imperforate hymen septus with irregular thinned out spots near the columns. 15 ounces collected. Eccentric hypertrophy of vagina.
7.	Broad Atresia (in the upper half.)	14¼ years.	1 month.	Formed of the uterus and the remains of the fornix.	Left side mobile.	June 1878.	Cure.	Per rectum there could be felt at the apex of the hæmatometra tumor a prominent curved margin with convexity directed backwards; in its middle was a hollow into which the tip of the finger could be pressed. This place was opened. Later, a portio with a thick anterior lip and a transverse slit for the os, was formed. Moderate stenosis, no menstrual difficulties. Atresia probably acquired in childhood. Has had Typhus and Diphtheria.

8.	Broad Atresia (in the upper half.)	17 years.	16 months.	Formed of the uterus and the remains of the fornix.	—	August 1878.	Cure.	When a child, had a purulent vaginal discharge. According to statement of physician, the hymen was closed, and was opened by him, and 8 ounces of an odorless, thick, pale-yellow fluid was evacuated. Hæmatometra tumor, larger than a child's head. Per rectum the os uteri could be distinctly felt as a soft, round spot into which two fingers could be introduced. A portio, with thick, anterior lips, was formed later.
9.	Broad Atresia (in middle third.)	15 years.	3 months.	Formed of the uterus and the upper one-third of the vagina	—	July 1881.	Cure.	Measles and Scarlet in children. No trace of cervix. Cure without stenosis.
10.	Broad Atresia (involving the entire vagina with the exception of a remnant of the fornix.	22 years.	1 year regularly, 2 years previously irregularly.	Formed of the uterus and a portion of the fornix.	—	March 1881.	Cure.	Measles at 6 years. Rudiments of hymen only. Urethra dilated. Anterior rectal wall drawn towards the atresia. Per vesicam the os felt as a soft spot the size of a 10 cent piece; it was situated at the lower portion of the tumor, and directed anteriorly and to the right. Too extensive tearing apart of tissues during operation. Could not obtain complete asepsis after operation. Hence seven septic phlegmons; nevertheless recovered after the formation of a fistulous abscess towards the perineum. After the cure, stenosis. 1 year later, in the asylum with melancholia. Returned thence with renewed hæmatometra. Dilation of the stenosis. Cure of the psychopathic symptoms. Persistence of the stenosis; no menstrual difficulties. Repeated attempts at dilatation useless. Persistence of fistula in perineum.
11.	Broad Atresia (in the lower half.)	18 years.	1 year.	Formed of uterus and fornix.	—	April 1882.	Cure.	Per rectum the os uteri felt like a spot as large as a 10 cent piece at apex of tumor. Later, os appeared as an oblique slit. No stenosis in the first weeks; 1 year later, moderate stenosis without further retention. Melancholic depression. After repeated dilatation, complete cure of the stenosis, and of the psychic depression. Observed during 1884 and 1885.
12.	Broad Atresia (in the lower half.)	16 years.	5 months.	Formed of uterus and fornix.	Left.	May 1882.	Cure.	Per rectum the os felt as a small, soft spot with prominent margin.

LIST OF CASES OF VAGINAL ATRESIA OPERATED UPON BY THE AUTHOR.

No.	Variety of Atresia.	Age.	Duration of Molimena.	Retention tumor.	Hæmatosalpinx.	Date of Operation.	Result.	REMARKS.
13.	Broad Atresia (in the upper half.)	17 years.	1 year.	Formed of uterus and fornix.	—	July 1884.	Cure.	Os uteri not distinguishable. Scarlatina at 10 years, followed for 10 weeks by a foul-smelling, discolored genital discharge with evacuation of membranes.
14.	Hæmatometra and Hæmatokolpos lateralis dextra.	19 years.	3 months.	Formed of the right horn of the uterus bicornis septus and the short vaginal rudiment belonging to it.	—	February 1877.	Cure.	Described by Johannowsky, (Prager Med. W. 1877, p. 297). Since then has menstruated regularly and has had three normal childbirths.
15.	Hæmatometra and Hæmatokolpos lateralis dextra.	25 years.	10 years.	Formed of the right horn of the uterus bicornis septus and the vaginal rudiment belonging to it.	—	May 1879.	Cure.	Has menstruated regularly since, and has had one child.
16.	Pyometra and pyokolpos lateralis dextra.	26 years.	10 years.	Formed of the right horn of uterus bilocularis and the vaginal rudiment belonging to it.	—	November 1869.	Cure.	Five years previously spontaneous rupture of the unilateral hæmatometra through the septum cervic. Arch. f. Gyn. Vol. II., p 84.
17.	Pyometra and pyokolpos lateralis sinistra.	20 years.	Irregular and infrequent menses for 3 years.	Formed of the left horn of the uterus bilocularis and the vaginal rudiment belonging to it.	—	January 1871.	Cure.	1¼ years before spontaneous rupture of the unilateral hæmatometra through the septum cervic supravaginal. The os uteri could be felt as a dollar-sized soft spot. (Correspondenzblatt für Schweizer Aerzte 1871, I., p. 100.)
18.	Hydrometra lateralis si-	38 years.	None.	Formed of the left horn and short va-	—	July 1872.	Cure.	Cervix recognizable as a round, soft and

I have encountered a number of circular stenoses in women pregnant for the first time, in whom there was no history which would point to an acquired affection. They rarely offer any serious hindrance to coitus or childbirth. As a rule, the softened tissues give way before the pressure of the head, as I have recently again had occasion to see in a case of spiral stenosis of the vaginal vault; so that active interference is unnecessary. Yet cases of marked stenoses of this nature have been recorded, which, when deep-seated, have doubtless been referred to duplexity of the hymen.[1] Thus Dr. Murphy found in a young and newly-married woman a transverse membrane pierced by a small opening above the hymen, which he divided on account of the trouble it caused in menstruation and coitus. Hemmer saw a similar membrane at delivery.

Extensive congenital strictures of the vagina have been repeatedly seen with defective development of the rest of the genitals, though but rarely when these latter were in perfect condition. And in the latter cases we have not always satisfactory proof of their congenital origin. Scanzoni[2] tells of a case he saw in 1851, in which in a woman who had been eight years married and who had remained sterile, he could barely introduce his little finger into the vagina, and coitus had never been properly accomplished. Nevertheless, the women became pregnant without dilatation being done, and the delivery was a normal one. Beigel observed[3] a case in which the vagina was stenosed to such an extent that only a uterine sound could be passed up it. The woman was twenty-three years old, and extremely delicate; she had menstruated regularly though scantily since her eighteenth year, had been three years married, and consulted Beigel for her sterility. The breasts were well developed; but the external genitals and the pubis were unusually small. The hymen appears to have been absent, since it is only remarked that the vestibule formed a small, mussel-shaped depression. Rectal examination revealed a small but otherwise normal uterus. The walls of the vagina were unusually hard and thick; and Beigel regarded this condition as the cause of the stenosis. Attempts at dilatation with compressed sponge and laminaria were fruitless. The same observer saw a sterile woman who had been married ten years, having menstruated irregularly since her fifteenth year, and never having had any disease of the genital apparatus, in whom there was a thick-walled stenosis of the upper third of the vagina.

When the vaginal canal is double, an irregularity in calibre has often been noticed, without there being any extra dilatation upon the other side. Veit claims that with this condition and with a single uterus, sometimes only that half of the vagina is used for coitus which is not connected with the portio vag.

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[1] Meissner, Frauenkrankheiten, vol. 1, p. 353.

[2] Krankheiten d. Weibl. Sexual Org., 5th ed. p. 641.

[3] Krankheiten d. Weibl. Geschl., Stuttgart, 1875 (F. Enke), vol. 2, p. 563.

We must be cautious in declaring blind canals in the mucous membrane, though they may occasionally be large enough to admit the little finger, to be rudimentary vaginæ. They usually lie just behind the vaginal entrance at one side of the columna rug. post., and are placed along the mucous membrane, or in the peri-vaginal connective tissue. They are often only unusually large and long lacunæ of the mucous membrane, and are characterized by their location, their smooth surfaces and thin walls, and by the fact that their axis is often a different one from that of the vagina. In two cases of this kind, which I have observed, these canals were 1.2 and 1.6 inches long; into one I could pass a thick sound, and into the other my little finger. Both were upon the left side; the narrower one was in a normally menstruating old maid, with perfect genitals, and caused occasional trouble by retention of secretion; and so I slit it up; the wider one was in a case far advanced in pregnancy, with great vaginal relaxation.

The diagnosis of congenital vaginal stenosis usually presents no especial difficulties; it can be recognized by sight in the hymenal form, and with the finger when seated higher up. The decision as to its being congenital depends upon the factors already considered under the head of atresia, and is sometimes very difficult to make. Here we usually have no retention-tumors of blood, as in atresia, although it has exceptionally occurred above very narrow or displaced stenoses. Therefore we will miss the history of gradual growth which is so characteristic of atresia. If there is retention at all, we will get a history of temporary amenorrhœa, followed by dysmenorrhœa, and a period of ease. Married women usually, but not always, complain of difficulties in cohabitation; but if both husband and wife are inexperienced, they may not notice anything. Naturally the mere absence of a retention tumor is not sufficient to warrant us in excluding a complete atresia; and when the stenosis is marked, the sound must be employed to demonstrate the uterine cavity.

We must also, as Scanzoni has warned us, be careful to avoid confounding the condition under consideration, with spastic stricture of the vagina. We will not always succeed in excluding it at the first examination, especially if we do not use anæsthesia. The vaginal contraction must not occur while we are examining the patient. Spastic contraction has been seen to occur limited to the upper segment of the vagina (with spasm of the levator ani; comp. Hildebrandt), thus simulating a blind sac with a narrow orifice. If there is any doubt, it is well to postpone a decision until a second examination has been made.

As regards the *prognosis* of these congenital atresias, we must recollect that the menstrual blood can flow off, and that the membranous and by far most frequent forms of the affection presents no insuperable obstacle to coitus, and is gradually dilated by it. Even when this is not the case, conception may occasionally occur, and the swelling and softening coincident to gravidity may make the parts so yielding, that delivery may take place without any artificial aid whatsoever.

A few of the cases of marked stenosis in which childbirth occurred in this way, undoubtedly belong in this category, though most of them are acquired. Thus in van Swieten's[1] case, the girl at sixteen years had a vagina so stenosed that a goose-quill could hardly be passed through it; but she became pregnant eleven years later, and had a perfectly natural labor, the stricture being noticeably more yielding after the fifth month. Evory Kennedy[2] observed with Dr. Johnson the first childbirth of a woman with very bad congenital vaginal stenosis, for the relief of whose difficulties in coition the sponge tent had been used. The first stage of labor lasted forty-eight hours; at the beginning the finger could only be introduced with great difficulty; but complete dilatation gradually occurred, and, without any other assistance than that derived from ergot, the labor terminated happily. Nevertheless experience teaches us that this result is obtained much less frequently spontaneously, than when the proper mechanical measures are applied. We must repeatedly examine the distensibility of the stenosed places during birth, so that when necessary we may make incisions, which should be done in several places, and as superficially as is compatible with our object. We may easily miss the favorable time for operation; as happened to E. Kennedy, who delayed operating in a case in which the head was pressing against a sickle-shaped membranous stenosis, so as to give his assistant an opportunity to examine the case, and saw a fatal rupture of the uterus occur. If the child is in a normal position it will probably be well to content ourselves with superficial incision with knife or scissors, and to avoid the use of the forceps, since it is undeniable that dilatation will be better effected by the spontaneously advancing head than it will be by the forceps.

In any case we obtain in this way the best results as regards the cure of the stenosis, although the stricture may possibly return as puerperal involution proceeds. Artificial dilatation of broad stenoses in non-pregnant women, whether done with tents, sounds, or dilators, gives, as a rule, insufficient and merely temporary results. In the case of thin membranous stenoses, incision of the edges with subsequent specular dilatation is the best method. Tamponing, also, when done with the proper precautions, may be of use.

In conclusion, we may mention the longitudinal septa among the developmental faults of the vagina, which occasionally form an obstacle to coitus, but more frequently interfere with delivery. They occur occasionally with uterus septus, though sometimes with a simple uterine cavity. Where the sept. vag. is extensive, it was probably originally a complete septum, in which previous confinements have made an orifi More rarely it is seen in virgins, marking the ununited ends of the M lerian ducts near the vaginal entrance. In either case it may happen t at a later delivery the advancing head may not displace the septum to side, but may push it before it in such a way that as a sagittal or obliq situated band it may form an obstacle to delivery. In three such ca division of the septum became a necessity. As a general thing. there no large vessels in the septum, and it may be cut without fearing hem rhage, in spite of its apparent succulence. Other and bloodless meth of division, such as the method by elastic ligature, which Freund lately recommended under other circumstances, are inapplicable here, account of the want of time. During the puerperium the divided e of the septum will shrink considerably.

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[1] Comment., Tome iv. p. 1315.

[2] Dublin Journ., vol. 16, p. 88.

The only other difficulty which would lead us to divide such s would be trouble in cohabitation; and also when the presence of the tum interferes with the local treatment of other troubles with pessa specula, tampons, etc. Under these latter circumstances it may be sirable to divide a complete septum, as Gehrung [2] did successfully in case.

There is little difficulty in locating, incising or excising a hymen sep for the fold of mucous membrane is always a thin one. Our interes the condition is rather genetic than practical. We are easily incline look upon it as the remains of the ununited Müllerian ducts, and to d therefrom conclusions as to the origin of the hymen. But the l development of the hymen is such as to disprove such an idea. I l seen hymen septus once in the living subject; there are five instance it in the Prague collection. In two of these specimens the septum r to the right, in one to the left, and in two it is placed fairly in the mi line.

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[1] This is shown by the atrophy in spots of uterine and vaginal septa in p peral women, which may go on until the tissues become transparent or dist orifices appear. A preparation in the Prague collection shows an atrophic t ning of this kind in the septum uteri the size of the palm of the hand.

[2] Amer. Journ. of Med. Sciences, 1874, cxxxvi. 445.

CHAPTER III.

ACQUIRED ATRESIAS AND STENOSES.

STENOSES and atresias of the normal vagina, with the exception of those cases in which tumors and infiltrations dislocate or twist the canal, and which do not belong under this heading, are always due to cicatricial contractions and adhesions. Their most frequent cause is undoubtedly puerperal necrosis and ulceration; as is proven by the extensive literature of acquired vaginal atresia.[1] In the thirty-six cases which Trask[2] has collected, not less than fifteen were due to childbirth. As is the case with vesico-vaginal fistula, it is the prolonged pressure in tedious labors rather than traumata incidental to artificial deliveries which forms the starting-point of the pathological changes. Rarely are other injuries the cause, as in Matheyssen's[3] case, where vaginal adhesions had occurred from a fall upon the genitals against the edge of a chair, at the age of four years. Schulze[4] had a case in which it was caused by a fall against the shaft of a wagon, and Hennig[5] one due to a girl three years old being run over. Osgood, Danyau, Thomas, and others, have observed cases of traumatic origin which were acquired in childhood. Cicatricial strictures and adhesions occur relatively frequently in connection with the wearing of pessaries, especially when retained for a long time. The Prague anatomical collection contains an example of the kind which occurred in a woman sixty-eight years old, who had worn a pessary thirty-four years for prolapsus. Other foreign bodies may also lead to prolapsus. Ch. H. Carter and I (comp. foreign bodies) have seen very marked cicatricial stenosis in consequence of the introduction of spools of cotton. Cauterizations have also been seen to cause them. Thus in the cases recorded by Madame Boivin and Dugès, a woman injected half a glassful of sulphuric acid into the vagina to produce an abortion, and entirely obliterated the upper ⅔ of the channel; the uterus ruptured and death occurred when labor began later on. And Levy,[1] who had to do a Cæsarean section, on account of such an atresia, and Lombard,[2] report two cases due to cauterization with sulphuric acid. And after an operation atresias and cicatricial stenoses have been seen to occur, not only following the use of cauterizing agents (ferrum candens and the galvano-cautery), but even after a polypus operation (O'Reilly).[3] But diseases are most often the cause, especially puerperal ulceration, and diphtheritic destruction in the course of other diseases, such as cholera (White, Nélaton); typhus (Böhm, L. Mayer, A. Martin); erysipelas (Renouard, Bourgeois); acute exanthemata, especially variola, (Richter, Murray, Scanzoni, Hennig). Extensive syphilitic ulceration has been repeatedly seen to cause incomplete and complete vaginal occlusion (Lisfranc, T. G. Thomas).

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[1] Comp. Meissner, Forschungen, etc., und Frauenzimmer Krankheiten.

[2] Amer. Journ. of Med. Sciences, July, 1848, p. 114.

[3] Annales de Méd., Belg. August, 1835.

[4] Allg. Med. Zeitg. July, Altenburg, 1832.

[5] Archiv. f. Gynäkologie, vol. 2, part 2, p. 372.

But the vaginal affection is sometimes purely a local one. Thus Simpson[4] calls attention to a variety of vaginal inflammation occurring in children, which he calls vaginitis adhesiva, and the peculiarity of which consists that it leads to adhesions without precedent ulceration. And the ulcerative form of adhesive vaginitis in adults which Hildebrandt has described, may lead to more or less extensive occlusion of the vaginal lumen.[5] If a ring-shaped or spiral cicatricial stenosis, either congenital or acquired in early childhood (see above), is present, it may lead in the course of a pregnancy to a secondary stenosis by adhesive inflammation of the hyper-plastic folds of mucous membrane, if the vaginitis has led to epithelial defects or superficial losses of substance. I have observed a very marked case of this kind in a primipara.[6] There was an apparently complete closure between the upper and middle third of the vagina; and only at the apex of the blind sac, which was strongly drawn over to the left, was an opening the size of a pin's head, which just admitted a sound. At one sitting the tissue gave way, with but little hemorrhage, to dilatation with sound and finger; a large amount of the retained yellowish mucus was evacuated, and the part of the fornix above the stenosis, together with the normal portio vag. became accessible to finger and speculum. Although the tissue which was torn only consisted of mucous membrane, it contained a cicatricial and resistant spiral ring at least .8 of an inch broad; and after complete opening of the vagina two fingers could hardly be passed through it, while the walls of the canal above and below were of normal elasticity and width.

In the light of these observations we can understand the reports which we occasionally see of the rare complication of a high grade of stenosis with pregnancy, and where the stenosis was relieved with disproportionate ease, and was only present to a slight degree after delivery.[1]

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[1] Bibl. for Laeger, October, 1860, p. 39.

[2] Gaz. Méd. de Paris, vol. 1, No. 14, p. 831.

[3] E. Kennedy, Dubl. Journ., vol. 16.

[4] Clin. Lect. on Dis. of Women, Edinbg. 1872, p. 259.

[5] Monatschrift f. Geb., vol. 32, p. 128.

[6] Breisky, Stenosis Vaginæ in Gravida, Prager Med. Wochenschr. 1883, No. 49.

Naturally, vaginal obliteration is not solely dependent upon morbid processes which are confined to the mucous membrane; the accompanying phlegmonous inflammation of the peri-vaginal connective tissue often plays an important part in it. Thick cicatricial bands and great shrinkage are the more common the more layers of tissue in the vagina and its neighborhood have been affected by the loss of substance. Hence the very large atresias from masses of new connective tissue after puerperal phlegmons, and the callous obliteration of the vagina in syphilitic peri-proctitis and peri-vaginitis, which often accompany stenoses and chronic ulcerations of the rectum. And the rare affection which Marconnet first described as peri-vaginitis phlegmonosa dessicans,[2] in which form of inflammation the entire vaginal mucous membrane is cast off, may, if it be survived, lead to extensive stenoses or obliteration.

The *course* of acquired atresia differs from that of the congenital form, only in that the symptoms, being dependent upon some especial etiological moment, do not necessarily begin at puberty, and that they are not infrequently accompanied by other pathological appearances, due to the same cause. Thus we find puerperal vaginal obliterations comparatively frequently with vesical fistulæ, and syphilitic stenosis with chronic ulceration, stenosis, and fistula of the rectum. For the rest, their course is the same as that of congenital occlusions; the menstrual blood accumulates above the atresia, if the same causes which have led to the atresia have not caused amenhorrhœa also.

The *treatment* does not differ from that of congenital atresias and stenoses. But there is one difficulty which often makes our task a very thankless one. That is, that the ulcerative processes which are at the base of the malady frequently cause extensive and firm cicatricial adhesions of the vagina, with partial destruction, approximation, and fixation of neighboring structures. Thus, besides the frequent complication with fistulæ which we have already mentioned, there is often a loss of tissue of the portio vag. in puerperal atresias.[3]

Nevertheless we have the records of not a few cases of complete cure. One of the most interesting of them, by Dieffenbach,[4] may be mentioned here. A lady whose vagina had become completely closed in consequence of injuries received in childbed, permitted a physician to attempt to re-establish the passage. But the doctor, instead of reopening the vagina, made his way into the bladder; thus adding a large vesico-vaginal fistula at the introitus to her atresia. Another physician sought to make his way to the uterus more posteriorly, and get into the rectum. The latter false passage, however, closed of itself. Dieffenbach succeeded in opening the vagina by a most difficult operation; and he kept it open by using bougies of gradually increasing sizes for a long time. The vesical fistula, large enough to admit a finger, was not cured, as the patient became disgusted after an unsuccessful attempt to close it had been made.

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[1] Heywood Smith, Obst. Trans. London, 1881, p. 117. Pilat, Ann. de Gynéc. 1882, Tome xvii. p. 133.

[2] Comp. chap. vii.

[3] Comp. Peter Müller, on Utero-vaginal Atresias. Scanzoni's Beiträge, 1869, vol. 5, p. 67.

[4] Operat. Chirurgie, vol. 1, p. 663.

On account of the difficulties which the dense cicatricial masses accompanying large fistulæ add to the operation for hæmatometra, Kleinwächter[1] prefers to follow Hegar's proposal, and leave it unopened, and prevents further menstruation by castration. Acute sepsis caused a fatal termination in the case he operated upon.

If the atresia occurs during gravidity, and is a broad one, as occurred in the cases which Levy, Lombard, and others have recorded, it may form an irremovable obstacle to spontaneous or even artificial delivery *per vias naturales*. In these cases the Cæsarean section is indicated, though under conditions which render the prognosis of the worst for the mother, since the free outflow of the lochia is interfered with. It has never yet been successfully done by the old methods. Porro's operation[2] is the only one available, as is admitted even by those who would restrict the indications for it in favor of the simple sectio Cæsarea.

Acquired vaginal stenoses are seen much more frequently than are complete closures. If a broad extent of vaginal surface is involved, treatment offers hardly fewer difficulties than in the class of cases we have just been considering. Such is the tendency of the stenosed cicatricial tissue to contract that the results of dilatation are but temporary in the majority of cases. Here also the best results are obtained when operation is done during childbirth. Then the atresiad zone is loosened and stretched, the incisions are more easily made, and the amount of dilatation attained is much greater than could be gotten at any other time; thus giving us better prospects of permanent benefit. Even under these circumstances, however, complete cure can only be attained when there are no extensive cicatricial masses present. I observed a case of probably acquired stenosis in a primipara twenty-six years old, with a justo minor pelvis. Unfortunately the history is wanting. The ring-shaped stenosis was situated in the upper third of the vagina, and was bounded by hard, cicatricial bands. The tips of two fingers could barely be passed into it. Since her sixteenth year the patient had menstruated regularly, abundantly, and without pain every four weeks. She saw blood last about the middle of

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[1] Prager Zeitschrift f. Hielkunde, 1883, vol. 4, p. 11.

[2] Della amputazione utero ovarica come complimento di Taglio Cesareo, Milano, 1876.

February, 1877, and claimed that March 14th was the date of conception. Pains began on December 8th at 2 A.M., the child being in the first occipito-posterior position. On December 9th, 2 A.M., the os was sufficiently dilated to admit the tips of the fingers. The collum was driven down deep into the pelvis, and lay against the stenosis. This latter was in the same condition as before labor, and formed an entirely unyielding ring through which the tips of two fingers could just be passed. 5 A.M., the os was somewhat more open, lying close behind the stenosis. Edges of latter moderately swollen; pains very violent. Three small cuts with the scissors opened the stenosis at once, so that three fingers could be passed in. 5½ A.M., os the size of a quarter dollar, rupture of membranes; chloroform for the pains. 5.45 A.M., another incision into the right border of the stricture, and a superficial incision of the cervix. Pains very marked, but the intervals quiet and painless. 6.45 A.M., under the influence of violent pains the obstacle gives way; the head descends, and fæces are expressed. As the heart-sounds were weak and irregular, at 7.15 A.M., extracted easily with forceps. Male child, premature, 17.6 inches long, and weighing 50 cunces. Circumference of vertex 30 inches. After a normal puerperium the stenosis returned about as before, but with edges less sharp than at first.

I have since that time had four analogous cases in which cicatricial stenoses formed obstacles to delivery in primiparæ.

It is proper to mention in this connection the irregular ligamentous bridges which originate in the vagina from the adhesion of detached folds of vaginal or cervical mucous membrane.

Occasionally we find pessaries which have been worn for years, and which have caused ulceration, more or less imbedded and fixed by granulation and cicatricial tissue, and by these bands above mentioned. When there are no such foreign bodies, the bands are important from the tension and injury they may be subjected to during coitus and childbirth. In one of my cases, there was a broad fleshy band 1.1 inches long and .4 inch broad, which extended from the anterior lip of the os uteri to the left side of the vagina. It was inserted 1.6 inches from the introitus and formed a serious obstacle to intercourse. It occurred in a woman twenty-two years old, after her first confinement. Division of the bridge, which was very vascular, and required a few sutures, easily relieved her.

CHAPTER IV.

DISPLACEMENTS OF THE VAGINA.

THE great distensibility and mobility of the vagina permits it to undergo both dilatation and displacement by neighboring organs to a very great extent, without interfering with the integrity of its attachments. Hence vaginal displacements do not possess the importance which attaches to dislocations of other organs. We would refer the reader to the introductory chapter for an anatomical description of these attachments.

Pathological dislocations of the vagina depend upon a change in the normal fixation of the organ, and form, as Klob[1] has rightly insisted upon, projections of the vaginal walls into its lumen. They may affect the anterior or the posterior wall, or the whole circumference. In consequence of the intra-abdominal pressure and the lesser resistance anteriorly, they will always lead either to descensus or prolapse, in accordance with whether the projection remains within the vulva or protrudes from it.

The conditions which influence vaginal dislocation are more or less connected with those that cause prolapsus uteri. They consist on the one hand of a loosening of the anatomical fixation bands, which are the predisposing conditions, and on the other hand of a force which acts either as a pressure from above or a traction from below. Pregnancy and childbirth especially cause loosening of the vaginal supports. The increase in vascularization and in mass of the vagina, the disappearance of fat from the peri-vaginal connective tissue, the venous stasis of the last month of gravidity, all these concur to affect an anatomical predisposition, which is immensely increased by the process of birth, with its acute tissue-loosening and immense vaginal dilatation. And when the child's head passes through the lowest portion of the vagina and the labia, the least mobile portion of the vagina is stretched and torn, and the relaxation of the perineal vaginal support is pushed to its utmost extent.

In a somewhat similar way voluminous uterine polypoid fibromyomata may fill the vagina and cause such a loosening of the attachments of that organ that descent and prolapse may be very marked after the growth has been extirpated. Other influences also, such as frequent tension and distension by coitus, persistent pressure by bladder, rectum, uterus, tumors of the true pelvis, or fluid accumulations, etc., may bring about the same result.

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[1] Path. Anat. d. Weibl. Sexual Org., p. 421.

In extreme old age and in marantic conditions the loosening of attachments may occur from the disappearance of the fat in the pelvic connective tissue and the atrophy of the muscular structures of the floor of the pelvis.

Prolapse of vagina and uterus are extremely rare in undeveloped girls. Examples have, however, been seen in very early life, as the following two cases, which I have seen myself, will show.

In one, which I saw at the Prague Foundling Asylum, a girl a few weeks old had a ring-shaped vaginal prolapse, which was easily replaceable with the finger through the exceptionally large introitus vaginæ. As soon as the child cried it reappeared. A more minute examination was not at that time possible.

But I possess more complete notes of a second case, which Prof. Epstein was good enough to send to me for examination. I have also a schematic sketch of the condition. It appears to me to be interesting enough to be reproduced. On February 28, 1881, Therese Roth, 39 years old, from Tiskow, near Prague, who had three weeks previously had her fourth labor easily and quickly, brought me her infant for examination. She had had twins the first, and triplets the third time. Immediately after birth the child had a rectal prolapse, and a tumor situated at the small of the back was noticed. On the fifth day a tumor appeared at the genitals, and it has remained there ever since. The child was badly nourished, but at full term; over the sacrum was a spina bifida sacralis with meningocele. The pelvis was fissured, though there was no external cleft; a yielding spot replaced the symphysis pubis, the arch being formed at most by a ligamentous band. Clitoris and labia majora and minora were normal; the hymen formed a thin, gaping, ring-shaped border, especially low upon the left side. The urethral orifice was considerably dilated, and the smaller vesical mucous membrane projected out of it as a small tumor. Out of the introitus protruded the portio vag. uteri, and there was a pronounced ectropian of the os. For the vaginal portion of the collum was greatly lengthened; a complete eversio vaginæ was not present, but the organ was short and prolapsed. Bimanual palpation was practised with the little finger in the rectum after replacing the prolapse, and with the other hand applied to the abdominal wall. By its aid, as also with the sound, I could satisfactorily decide that the uterine body stood at its usual height. The rectum formed the largest prolapse. The succeeding sketch shows the condition.

Examination with the sound gave the following measurements:

Length of uterine cavity, ...	1.6 inch
Anterior vaginal wall from introitus to arch, .	.7 "
Posterior, " " " " .	.8 "
Left, " " " " .	.9 "
Right, " " " " .	.8 "

Especially remarkable was the relaxation and thinness of the perineum and the muscular floor of the pelvis. When the child cried they were ballooned out. The child nursed well; spontaneous movements of the lower limbs were normal, though the reflex motions were slow.

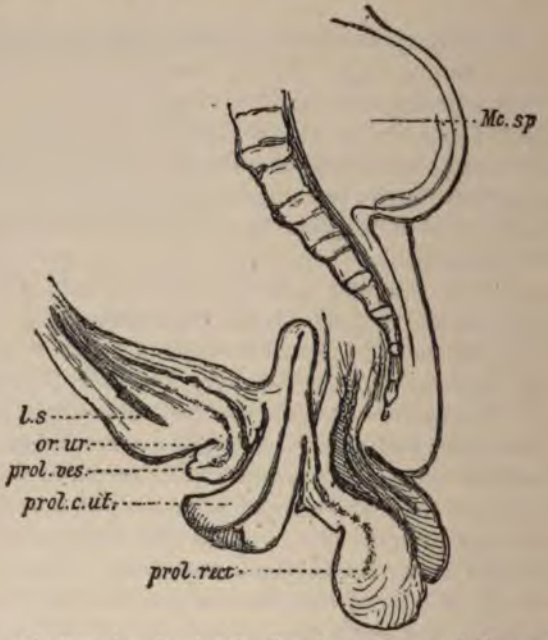

FIG. 20.—*Mc.sp*, Meningocele spin. *l.s*, Lig. Symphyseos. *or.ur*, Orific. urethræ. *prol.ves*, Prolapsus vesicæ. *prol.c.ut*, Prolapsus colli uteri. *prol.rect*, Prolapsus recti.

Unfortunately Professor Epstein's efforts to obtain permission for a *post-mortem* examination in the probable event of the child's dying were fruitless.

Under these circumstances we can say but little as to the anatomical conditions present which had led to the prolapse of all the organs that lie along the floor of the pelvis. I can only surmise that an imperfect development, and perhaps an abnormal position of the muscular structures of the pelvic floor, may have caused its relaxation, and the dilatation of the places of exit of urethra, vagina, and rectum. The presence of fissure of the symphysis and of spina bifida would favor this view.

There are no other anatomical investigations concerning the condition of the muscular and aponeurotic pelvic floor in these cases. Not only is this so with rare congenital anomalies such as we have been considering, but it is also the case with the very frequent acquired descensus and prolapsus. From a clinical point of view Schatz[1] and Emmet[2] have called attention to the importance of the ruptures and contusions of the muscular structures of the pelvic floor incidental to childbirth; and Hegar[3] has insisted upon its efficacy as the etiological agent in displacements of the pelvic organs.

Billroth has recorded a case of prolapsus uteri with vesical ectopia in a girl eighteen years old, and has added a handsome drawing to it.[4] The sketch shows us that the pelvis was fissured and the perineum imperfectly developed.

Among the more recent literature a case of Prochownik's[5] deserves mention here. The girl was a virgin, twenty years old, and had prolapsus septus with congenital deficiency of the perineum. Prochownik believes that the earlier occurrence of the prolapse in this case was prevented by the tension of the lateral attachments of the uterus, although a deficient development of the muscular structures of the pelvic floor could be recognized. I think also that the shape and breadth of the womb, in relation to the lumen of the vagina, had something to do with it. After the patient had had to do very hard work upon very poor food for seven months, a prolapse occurred. It was well retained by a Schatz pessary.

Undoubtedly dilatation and relaxation of the introit. vaginæ can usually be proven to be among the efficient causes of vaginal dislocation. Yet the influence of rupture of the perineum as a predisposing moment, has been much overestimated, since without doubt the larger number of vaginal prolapses occur without its being present.

The loosening of the attachments which we have described explains the occurrence of a displacement in layers of the septum vesicæ and rectovaginale in those cases in which the bladder or the rectum does not follow the dislocation. Only in exceptional instances are we unable to prove the anatomical reasons for predisposition of the vaginal attachments to be loosened; and in these the amount of pressure or of traction must have been enough to overcome the resistance of the normal means of fixation.

As to the participation of neighboring organs, uterus, bladder, and rectum, in vaginal displacements, we must distinguish between primary and secondary projections. In the first case the vaginal walls sink on account of their loosened attachments, not being able to withstand the normal amount of pressure which bears upon them; and the organs attached to the vagina follow it. In the second case the vagina is permanently displaced by the constant pressure and tension exercised upon it by the neighboring organs. In advanced cases these causal relations cannot always be distinguished.

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[1] Arch. f. Gyn., vol. 22, p. 298.

[2] Princ. and Pract. of Gynecology, 3d ed. 1884, p. 367.

[3] Deutsche Med. Wochenschr., 1884, No. 36.

[4] Chirurg. Klinik, Berlin, 1879.

[5] Arch. f. Gyn., 1881, vol. 17, p. 326.

The protrusion of the anterior wall (descensus or prolapsus vagin. anterior) may be partial, and originates now from the lower and now from the upper segment of the vagina; or it may be complete. In both the latter cases it is regularly accompanied by sinking of the collum uteri.

Partial descent of the lower segment of the wall, sometimes prolapsing to a moderate extent through the vulva, is dependent upon the projection forwards of the lower extremity of the columna rugarum ant., (the tuberculum vag. of Luschka, and the carina vag. of Kohlrausch), just below the urethral orifice. It occurs from swelling of the mucosa and the submucosa, and is frequently seen in gravidity from the combination of venous stasis with the hyperplasia of pregnancy. Its dark livid color, and succulence, as well as the fact that it occurs in primiparæ only during the last three months, and in multiparæ, together with phlebectasias of vulva and vagina, show how much venous stasis is concerned in its development. Nor does it always retrogress during the puerperium; and we find it in women who have borne children as a dense tumor of the normal color of the mucous membrane, and composed of the hypertrophied mucosa and submucosa. If the prolapse is more extensive, the covering mucous membrane becomes skin-like. The direction of the urethra is not much changed, though its orif. ext. is usually gaping and displaced somewhat forwards; occasionally it is covered by the prolapsed folds which lie behind it.

Unimportant as the prolapse may appear, it does give trouble to the patient, especially during pregnancy. It then becomes swollen from venous stasis; its surface is dry, and perhaps irritated or eroded, and there occur in consequence bearing-down pains and difficulty in walking and sitting. When the hypertrophied prolapse becomes long and comb-shaped, and, by dragging upon the contiguous portions of mucous membrane, displaces the sept. ves. vag., it becomes of even greater importance.

Very frequently there occurs in connection with the above-mentioned partial dislocation, a displacement involving the septum ves. vag. At first this only occurs when the bladder is distended or the abdominal pressure exerted; later it is always seen when the patient is in the erect position; and finally it is present even when the patient is lying down, as an egg-shaped or large prolapse. The soft tumor can always be readily replaced after the bladder has been emptied. When well marked, it obliterates the anterior fold of the vaginal vault, and is regularly accompanied by depression of the portio vag. uteri. The various layers of the sept.

res vag. are so intimately united, that the bladder, as a rule, takes part in the protrusion, giving us a cystocele vaginalis (Malgaigne.[1]) Most of these cases are of puerperal origin, and therefore we think that as a rule, the prolapse of the vaginal mucous membrane is the primary, and the sinking of the adjacent vesical wall the secondary phenomena. In newly delivered women we will often notice a slight degree of sinking of the vaginal wall. This is to be explained by the enormous dilatation of the vaginal sac, the gaping of the rima vulva, and the relaxation of the perineum, *sub partu*. If the sinking of the anterior wall and of the bladder that is connected with it, is more marked than usual, as may be the case after difficult labors or speedy extractions, a valve-shaped bend of the urethra may occur, the anterior portion of that canal, being fixed by the lig. triang. remaining.

Thus there occurs that obstacle to urination to which Mattei and Olshausen have drawn attention. It is not of very frequent occurrence, and can easily be remedied by giving a proper direction to the catheter.

A moderate protrusion may easily be increased to a prolapse, by getting up too early from childbed, physical exertion, or by retention of urine for too long periods of time. Venous stasis, swelling, and increase of weight then occur. Prolaps. vag. ant. with cystocele, exerts a double influence upon the puerperal uterus. On the one hand it tends to maintain the anteversion of the uterine body, the urinary bladder descending, and the womb following it; and on the other hand the tension exercised by the prolaps. vag. extends to the anterior lip of the os, and the anterior wall of the supra-vaginal portion of the organ. As a rule the uterus does not give way to this tension as a whole. The collum, relaxed and thinned *sub partu*, is distensible enough to stretch to a moderate extent. If the orif. ext. is so torn across that traction is not at once transferred from the anterior to the posterior lip, there occurs a unilateral elongation of the collum. The anterior wall is drawn out in gutter-shape, and the prolapsus vag. follows it; while the posterior lip remains stationary, or only sinks to a very small extent. This form of displacement is especially well marked when the uterine body is attached by adhesions or tumors to neighboring organs. Schröder has described the condition as one of hypertrophy of what he calls the portio media, the median segment of the uterine neck.[2] I have observed it many times, and have invariably been able to prove its secondary origin.

The habitual retention of urine by women for long periods of time, has been by many authorities, and especially by Scanzoni,[3] regarded as the cause of the formation of cystocele, in contradistinction to the above described primary origin of the prolapsus vag. ant. This is indubitably the case in a certain number of cases, but not in as many as are of puerperal origin. Protrusions of the anterior vaginal wall by tumors (cysts, dense submucous new growths, hæmatokolpos, and the like) are to be considered under the heading of their special causes. And besides this, descent and prolapse of the anterior vaginal wall frequently occur as part of the total vaginal prolapse which follows descensus and prolapsus uteri.

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[1] Journ. de Chir., Nov. 1843, p. 353 [2] l. c. p. 71 to 81. [3] l. c. p. 659.

In a few rare cases the bladder remains in its normal place with prolapsus vag. ant., the peritoneal pocket of the excavatio vesico-uterina on the other hand being abnormally depressed and drawn forward into the prolapsus. This occurrence has been supposed to be a special form of dislocation of the anterior vaginal wall, due to the sinking of this cavity, and has been called hernia vaginalis anterior.[1] But the loosening of the bladder and urethra from the uterus and vagina, with depression of the anterior peritoneal pocket, as has been represented in some of the drawings, does not appear to exist at all; rather the septum urethro-vaginale under all circumstances forms the boundary up to which the anterior vaginal wall may be separated from the bladder.[2] Hüffel's excellent drawing of a section of the pelvis with prolapsus ut. incompl., without any change of position of the urinary bladder, shows us how the separation of the prolapsed anterior vaginal wall from the bladder is limited anatomically by its intimate connection with the layers of the urethro-vaginal septum. It shows also a relatively firm vesical attachment, the peritoneal covering of the organ lying above the upper edge of the symphysis, and the ligamenta vesicalia being tense. On the other hand the connective-tissue union between the portio supra-vaginalis colli uteri, the upper part of the anterior vaginal wall, and the bladder, appears to be unusually loose and to be stretched into a thin stratum. Had the bladder been depicted empty, all the conditions necessary to originate a hernia vaginalis anterior, might have been demonstrated in this drawing.

Since a congenital depression of the excav. ves. ut. has not been noticed, and since in the few cases of the affection which have been recorded, there has always been the complication of prolapsus uteri totalis or partialis present, we must regard hernia vaginalis anterior as an acquired dislocation. For its development the urinary bladder must be firmly attached to the anterior abdominal wall, and there must be an unusually loose connective-tissue layer between the supra-vaginal portion of the collum uteri and the bladder, and between the anterior vaginal wall and the bladder; and finally the excav. vesico-uterina must be abnormally broad from reclination of the body of the womb, and must also be drawn down by the prolapsus colli uteri. When these conditions are present, the intra-abdominal pressure upon the excav. ante-uterina on the one hand, and the tension of the prolapsus upon the other, may be able to cause dislocation and separation of the layers of the septum vesico-vaginale in a degree such as E. Martin has described. The anatomical disposition in question

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[1] The older authorities (comp. Meissner, l. c.) include cystocele vaginalis also in this designation. The rarity of this form of the malady, and we have never seen a single case, is shown by the fact that it is not mentioned in the text books on pathological anatomy of Rokitansky, Förster, Klob, Klebs and others.

[2] The most striking, as well as the best described case is that of E. Martin (Monatschrift f. Geb., vol. 28, 1866, p. 168), which both Hüffel and Hegar and Kaltenbach have copied. But we must object that the drawing, which shows a complete division of the connection between the anterior vaginal wall and the bladder from the sinking of the anterior peritoneal pocket, and extending almost through the entire urethro-vaginal septum, is not in accord with Cohnheim's record of the autopsy. Cohnheim expressly says that the anterior vaginal wall, together with the urethra, was for an inch in length in its normal position behind the pubis (p. 169), whilst the portion above that was markedly lengthened, thickened and prolapsed.

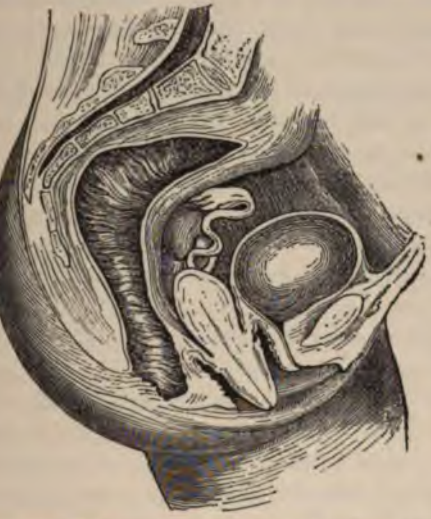

FIG. 21.—SECTION THROUGH THE PELVIS WITH INCOMPLETE PROLAPSUS UTERI. (After *Hüffel.*)

is most intimately connected with the etiology of prolapsus uteri; and we can only look upon hernia vag. ant. as one of its consequences. We cannot recognize its primary occurrence from the cases thus far described.

The diagnosis of prolapsus vag. ant. needs but little consideration after what has been said. It may, however, be necessary to distinguish it from protrusions caused by new growths in the septum ves. vag., or from congenital anomalies with unilateral closure of the vag. septa and retention of fluid. The dilatation and separation of the layers must be especially considered. This is to be done by examining the vesical dilatation with the catheter, and by finding out the exact position of the uterus. If cystocele is present, the catheter will go downwards a short distance behind the orif. urethræ, and its point can be felt through the protruded wall. If the bladder does not participate in the protrusion of the wall, it can easily be proven with the catheter that the viscus has not sunken, and thus we can ascertain whether we have to deal with a hypertrophic prolapse of the mucous membrane, an interstitial neoplasm, or the lateral half of an atresiad vagina distended with fluid. In the latter case the uterus will be situated at its normal height.

The symptoms resemble in general those of descensus or prolapsus uteri. They consist of impediments in walking, standing, or any hard work, which causes increase in the size of the tumor, in irritation of the prolapsed mucous membrane from dessication and friction, and finally, in frequent desire to urinate. Only when the prolapse is very marked can urinary retention occur from bending of the urethra, or more rarely from pressure or tension upon the ureters. Some observations seem to show that cystocele vaginalis may form a mechanical hindrance to childbirth;[1] but it was in cases where, from an abnormal position of the head, or from absence of the proper relation between it and the pelvis, an unusual amount of compression of the full bladder against the anterior pelvic wall occurred. In this way the viscus was forced into an hour-glass shape; and the tense pelvic portion formed an obstacle to delivery which sometimes, as in Moor's case, could not be removed by the catheter.

Much may be hoped from treatment, even when it is restricted to rest in bed, frequent emptying of the bladder, looseness of the bowels, astringent and cooling injections, and the introduction of tampons of absorbent cotton of not too large size, to be changed night and morning. But frequently this treatment alone is not enough, and in old cases it is useless to attempt to accomplish anything with it. Thus operative narrowing of the vagina, kolporrhaphy, or palliative treatment with pessaries and bandages, need only be considered. The operative treatment of prol. vag. ant. must not, to be successful, be confined to the anterior wall. All the various methods of anterior kolporraphy do not ensure us against a return of the cystocele; under the influence of the abdominal pressure the scar gives way, and the vaginal wall comes down. Kolpoperineorrhaphy must be done, or a septum-like connection between the anterior and posterior walls, after the methods of Neugebauer and Lefort, be made, to prevent the inversion and prolapse of the vaginal wall. I cured a case of very marked cystocele vaginalis in an elderly woman, in whom all palliative measures for the retention of the prolapse were useless, by Neugebauer's operation; and I came to the conclusion that in just such cases, where the cystocele was the most important part of the malady, it promised better results than in cases of total utero-vaginal prolapse, since there was less pressure upon the cicatrix. It has been attempted to improve the patient's condition, by sustaining the organ in various ways. We will only mention a few here, the object of which is to lift up the anterior vaginal wall. Such are pessaries[1] designed to raise the anteverted uterus, *point* those of Graily Hewitt and Thomas. When these instruments find a sufficient point *d'appui* in the vagina, so that they may be worn without causing too much tension, they act by sustaining the replaced septum ves. vag. upon their horn-shaped convexity. Occasionally the instruments which Vuillet and Kehrer have recommended for the retention of uterine prolapsus will be found applicable. More efficient, but much more irritating from the fact that their fixation point lies without the pelvis, are the stem pessaries which are fastened to a pelvic band, and which elevate the anterior vaginal wall either alone or together with the uterus. Roser's hysterophor is the best known of these arrangements, and has been modified by many surgeons, especially by Scanzoni and Lazarewitch. But they have all fallen into desuetude from their uncomfortable nature, and from the irritation they caused; and in non-operative cases, where the above-mentioned pessaries are not supported, voluminous instruments designed to sustain the uterus are employed, now one form and now another being recommended. Most of them are, however, open to the objection, that they only prevent vaginal prolapse by great dilatation of the channel above the introitus; they exercise considerable pressure, cause the rima vulvæ to gape, and set up an intense catarrh of the vaginal mucous membrane. If the necessary conditions are present for the retention of the egg pessaries, to be mentioned later on, they will render the most efficient service in these cases.

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[1] Brennecke (Sudenburg-Magdeburg), Centralblatt f. Gyn., 1879, p. 30. Dick (Bern), Ibid. p. 154. More, Ibid. 1880, p. 212 Ref. from: Obst. Journ. of Gr. Br. and Ireland, January, 1880, No. 82, p. 620.

Displacements of the posterior vaginal wall (descensus and prolapsus vag. post.) more frequently occur without participation of the adjacent organ than do those of the anterior wall, on account of the loose connective-tissue union between vagina and rectum. Here also the descent may be partial, and affect the upper or the lower segment, or it may involve the entire extent of the wall.

Partial descent of the lower division of the posterior vaginal wall is an everyday occurrence in its lesser degrees, in women who have borne many children. It appears as a prominent tubercular fold of thickened mucous membrane, situated at or near the median line, corresponding to the lower end of the columna rug. post. Its occurrence is by no means limited to women who have perineal scars, but is always found in conjunction with a wide vaginal entrance. When much developed it forms a prominent comb-like tumor extending an inch or more into the vaginal canal; it gets less in volume as it ascends, and bears some similarity to a rudimentary septum vag. It very rarely occurs during a first pregnancy, like the protrusions of the anterior wall, but is usually formed during

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[1] As regards the various forms of pessaries, we must refer the reader to the chapter on uterine displacements.

labor and the puerperium. Pregnancy predisposes to it only from the hyperplastic development of the vaginal walls and the loosening of the peri-vaginal connective-tissue. The great stretching and tension upon this portion of the wall when the perineum is distended in labor, and the cicatricial traction caused by ruptures at the posterior vaginal entrance during healing, complete the process. Nevertheless, it is undeniable that in many cases of exquisite prolapse of this kind, there are no perineal cicatrices. The partial protrusions of the upper segment of the posterior wall occur only exceptionally as lax transverse folds of the mucosa, at the place of the normal posterior *cul-de-sac* of the vaginal vault; more generally they are seen as extensive inverted depressions of the posterior vaginal vault. These are really secondary occurrences; since they are dependent upon descent of the uterus, or of Douglas's pouch, or upon excessive dilatation of the recto-vaginal septum from the side of the rectum. In the latter case they are large from the beginning, and involve the entire extent of the posterior wall above the perineum. When the rectum is full the sac is tense and does not fall; but when it is empty it immediately prolapses.

The participation of the anterior rectal wall in the protrusion, rectocele vag., occurs either to a small extent only or not at all. Only where there is a high degree of total prolapse does it occur to any extent. The tumor may then, as Freund[1] has shown, reach an extreme size.

All the partial dislocations of the posterior wall are easily increased by the pressure exercised upon the tumors by the uterus and intestines, and by the abdominal pressure. They may then form extensive prolapses, their lower end usually appearing free just behind the posterior commissure of the vulva. The retroflexed uterus always follows the tumor, when it is not fixed in the pelvis by tumors or adhesions; and the peritoneal excavatio retro-uterina is always drawn deeply down.

Secondary protrusions are formed when the retroverted and enlarged uterine body, or tumors of the uterus or its adnexa, or encapsulated collections of fluid (hæmatocele, pelvio-peritonitic abscess, hydrops saccatus) or an extra-uterine fœtal sac, lie in and depress Douglas's *cul-de-sac*. Free fluid may also, though more rarely, do the same thing, as when there is much ascites. We must agree with Hegar and Kaltenbach in regarding hernia vag. post. or enterocele vag. as a rare cause of protuberance of the posterior wall without uterine prolapse being present. The reason is that the coils of small intestine which lie in Douglas's *cul-de-sac* can be more easily displaced from it, and forced into the abdominal cavity, than could the elasticity of the walls of the *cul-de-sac* be overcome, and the vaginal surface protruded. There must at all events be a relatively narrow entrance to Douglas's *cul-de-sac*, which may of course occur from an increased development of the sickle-shaped connecting band of the plicæ semilun. which Kohlrausch has figured, or from acquired pathological adhesions. In this case the tension of the hernial tumor may be great enough to cause a considerable displacement of the womb, and to hinder reposition. This we had occasion to see ourselves in the case shown in Figs. 22 and 23. Landau[1] relates an interesting case which belongs here. A woman forty-eight years old had had nine children, and suffered from ob-

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[1] Path and Ther. of Chronic Inversion, etc., Breslau, 1870, p. 30.

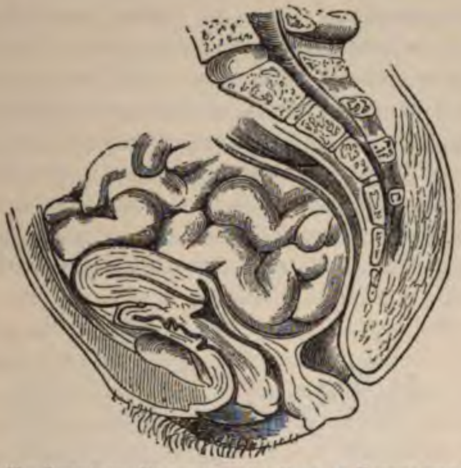

FIG. 22.—SCHEMATIC DRAWING OF MY CASE OF ENTEROCELE VAG.

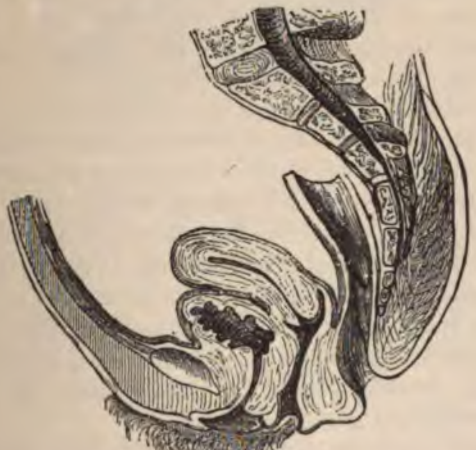

FIG. 23.—THE SAME CASE AFTER REDUCTION OF THE ENTEROCELE.

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[1] Report of Spiegelberg's Klinik at Breslau for 1873–75, in Berl. Kl. Wochenschrift, 1876, No. 48.

stinate constipation and meteorism. An enterocele vag. appeared, which protruded downwards and became tense during the pains. It formed an obstacle to delivery, resisted all attempts at reposition in the lateral position, and was only displaced when the patient was deeply anæsthetized and the whole hand introduced into the rectum. The diagnosis of enterocele vag. is to be made in these cases by the soft elastic resistance of the tumor and the occasional rumbling during manipulation, and may be completed by percussion upon a long spool-shaped pleximeter. If reposition is even partially successful, the diagnosis is simplified; in our case it could not be done, though repeated attempts were made to effect it in the knee-elbow position. But it occurred spontaneously after a lengthy course of mild laxatives. Although the symptoms were not troublesome, they were decidedly similar in character to those of an old hernia with large opening. The woman was a field hand, and the tumor pained her when she walked or stood for long periods of time, and caused difficulty in defecation. We know of no case in which symptoms of strangulation have been observed; but we cannot deny the possibility of the occurrence of the accident, especially when peritonitic adhesions of the intestinal coils are present.

It is much more common to see loops of intestine descend into Douglas's pouch, when that fold is drawn down in prolapsus uteri and inversio vaginæ. But even here the intestine rarely reaches to the lower limit of the tumor. As a rule, we find tympanitic resonance only at the upper parts of such prolapsus, though Rokitansky[1] and Fehling[2] have described remarkable cases in which rupture of the posterior wall of the prolapse and descent of coils of intestine through the tear occurred.

As to treatment, we can only relieve secondary invaginations of the fornix and the upper portion of the vagina when we succeed in removing their causes. If the descent and prolapse of the lower division of the posterior vaginal wall is great, but little is to be hoped from the measures recommended for the relief of cystocele, even in recent cases. Retention by means of pessaries is only useful in those exceptional cases in which the vulva is not much dilated. We must here rely upon surgical procedure; and it is only because in uncomplicated cases, where there is no prolapsus uteri, the troubles caused by the condition are not great, that operations are so seldom done.

Descent of the vagina in its whole circumference, inversio vaginæ, so common in marked cases of uterine prolapse, may be due to an even displacement of the vaginal vault which drags the surrounding walls of the canal down with it, or to a protrusion and approximation of the anterior and posterior segments of the vaginal tube. (Fig. 24.)

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[1] Lehrb. d. Path. Anat., 3d ed. vol. 3, p. 515.

[2] Arch. f. Gyn., vol. 6, p. 103.

In the first case direct pressure is the cause of the displacement. The vaginal vault may be pressed upon by the uterus or the abdominal muscles, or, more rarely, by tumors. Relaxation of the pelvic connective tissue, and of the vagina and the uterine ligaments, predispose to the affection. Hence its frequency in the puerperium, and in old age, and hence also the great preponderance of cases among the working classes. An originally low position of the uterus with a short vagina, as well as flexions of the womb, predispose to inversion; but I do not think that small inclination and great width of the pelvis exercises by any means that influence which many authorities, and especially Kiwisch, have ascribed to it. Under these circumstances there usually first occur primary descent of the uterus and depression of the vaginal vault, from abdominal pressure, the womb itself being normal, or, if senile involution has set in, even sub normal as regards weight. But, of course, the enlarged uterus might pull down the vaginal vault by its weight, if its volume is not too great and it is not fixed by adhesions. Only in rare cases do we find vaginal descent in consequence of hypertrophy of the collum. Where we do see it, the hypertrophy affects the vaginal portion of the neck, and gradually drags the entire uterus and the fundus downwards.

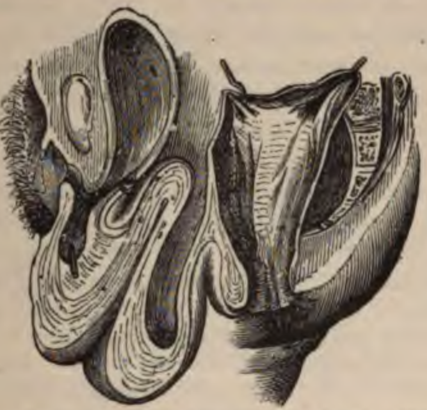

FIG. 24.—INVERSIO VAG., WITH INCOMPLETE PROLAPSUS UTERI. (After *Cruveilhier*.)

When the inversio vag. has occurred in this way, and has led to a prolapse of the whole inverted vagina, the tumor always includes the entire uterus. But if on the other hand the inversio vag. proceeds from prolapsus vag. ant. and post., the uterine descent is secondary, and often involves only the elongated collum; the corpus uteri itself taking little or no part in the displacement.[1]

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[1] Virchow was the first (Coll. Works, p. 812) to claim that inversio vag. occurs from the hypertrophied collum pushing the vaginal vault before it in its growth. Although objections have been raised against it on various sides (Kiwisch, Speigel-

From what we have said in regard to the etiology of prolapsus vag. ant. and post., it will be seen that the puerperal state furnishes the chief condition necessary for the origination of inversion with prolapsus colli uteri.

But whether vaginal inversion be primary or secondary, it always increases in size, and finally forms a prolapse of the total inverted vagina. At its lower portion will be seen the orif. ext. uteri, situated to one or other side in accordance with the relative protrusion of the anterior and posterior portions of the tumor. Its shape depends partly upon its contents, and partly upon the amount of thickening of mucosa and submucosa. It is usually either cylindrical or pear-shaped. The walls of the prolapse at first are thin; but in time the hypertrophy of the dry, dermoid-like mucous membrane and of the submucosa, may become so great that the walls of the tumor nearest the portio vag. may measure from ½ to 1 inch in thickness, and the whole mass be compared, as has been done by Klebs, to an elephantiasis. The surface will then be smooth, rugosities being absent; the epithelium is thickened; and not infrequently erosions and fissures lead to losses of substance very like varicose ulcers. This is favored by the intense venous congestion of the hypertrophic tissue. In old inversions which have not been replaced for years, the thickness and rigidity of the walls is often so marked that it forms a great

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berg, Schröder and others), it is accepted by most pathologists and a large number of gynecologists. I do not believe it to be correct, for all the peculiarities of the condition are more easily explicable as being due to tension of the prolapsus vag. than to a local hypertrophy of unknown origin. For, firstly, we only find such elongations of the supra-vaginal portion with prolapse of the inverted bladder, under conditions in which tension cannot be excluded. That this tension does cause elongation of the supra-vaginal portion of the collum may be directly observed, as Kiwisch has suggested, by noticing the shortening which occurs after reposition. This can be best seen in the gutter-shaped elongations of the anterior wall of the collum in prolaps. ant. and cystocele. The thinness and pliability of the tissue of the supra-vaginal portion favors the idea of a secondary extension; for the hypertrophied part would have to be increased both in thickness and resistance to overcome the fixation of the vagina. And it is especially to be noted that this form is always of puerperal origin, thus originating at a time when the resistance of the collum is at its least, and the conditions favoring primary vaginal prolapse most pronounced. It is exactly the lengthening, thinning and relaxation of the cervix up to the int. os in childbirth which renders it conceivable how the supra-vaginal portion can give way before the tension without dislocating the corpus uteri. Too early rising and hard work during the puerperium will cause descent of the vagina, and the descent soon leads to increased tension at the vaginal insertion of the collum uteri. If the collum is yielding, it will be stretched in its supra-vaginal portion—between the internal os and the vaginal insertion; its normal involution and shortening will be hindered by the steady tension of the vaginal prolapse, and lengthening be caused by the gradually increasing weight of the growing prolapsus vag. It is readily conceivable that a certain amount of hypertrophic growth will accompany this elongation, but it is determined primarily by the vaginal prolapse.

though, in our experience, a not impassible hindrance to reposition. The portio vag. uteri is blended in with the walls of the tumor. This is due to the hypertrophy above-mentioned, and also, if the os is ruptured to any great extent, to the ectropion-like eversion of its lips. These, together with the other changes occurring in the mucous membrane of the portio vag. and the cervix, will be considered in connection with prolapsus uteri.

The symptoms of inversio vag. will consist of those of partial displacements together with those of prolapsus uteri The diagnosis also needs no further elucidation. Only in rare cases is inversio to be observed in the stage in which the portio vag. does not occupy its lowest point. It then forms a prolapsed, ring-shaped vaginal tumor, in the middle of which is a funnel-shaped orifice which leads to the portio vag. (Fig. 26.) This is the transition form between a prolapsus ant. and post. beginning at the lower segment of the vagina, and a complete inversion.

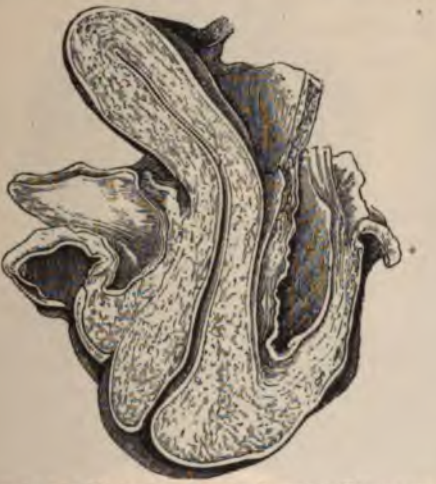


FIG. 25.—SECTION THROUGH THE HYPERTROPHIC AND INVERTED VAGINA IN A CASE OF PROLAPSUS COLLI UTERI. (After *Farre*.)

Even in slight cases of circular protrusions of the vagina, treatment by rest in bed, and astringent injections and tampons, will usually not be sufficient; and in complete and old inversion, the tumor may be so large, and its walls so thick, that reposition itself may be very difficult. In these cases we must first remove the intra-abdominal tension by emptying the bladder and placing the patient in the knee-elbow position. If its surface is dry and crusted, it should be covered with linen cloths soaked in water, oil, or glycerine. The tumor is best reduced in the knee-elbow position, pressure being made upon all sides of the mass, and the portio vag. first, then the posterior, and then the anterior wall pushed up. Occasionally the reposition of the portio vag. alone will cause the reduction of the whole tumor. It is important to ascertain whether the uterus has prolapsed *en masse*, or whether only the elongated collum has come down. If the former is the case, it may hinder reposition by its mass and position. It is best replaced by pushing it up somewhat obliquely, with one tubal angle in advance. It is generally easier to reduce the inversion in prolapsus colli uteri, since the elongated collum tends to go back as soon as the cystocele is replaced. Freund (l.c.) has observed a quite unusual obstacle in the shape of a colossal rectocele filled with fæces; it took two weeks rest in bed, and careful emptying of bladder and rectum before he could replace the prolapse. Fehling's case (l.c.), in which a rude attempt on the patient's part to replace the mass caused rupture of its wall and prolapse of coils of intestine, will serve to warn us against the use of violence in our attempts at reduction.

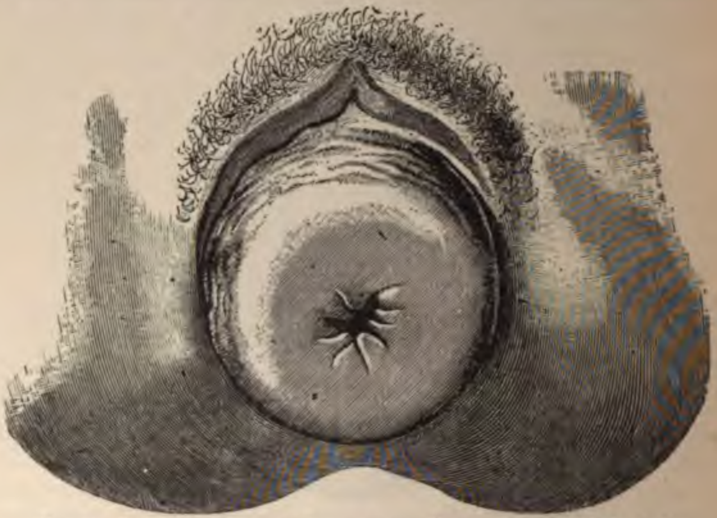


FIG. 25.—PROLAPSED CIRCULAR TUMOR OF THE VAGINA. (After *M'Clintock.*)

It is much more difficult to maintain the reposition, if we do not content ourselves with palliative treatment by pessaries and bandages.

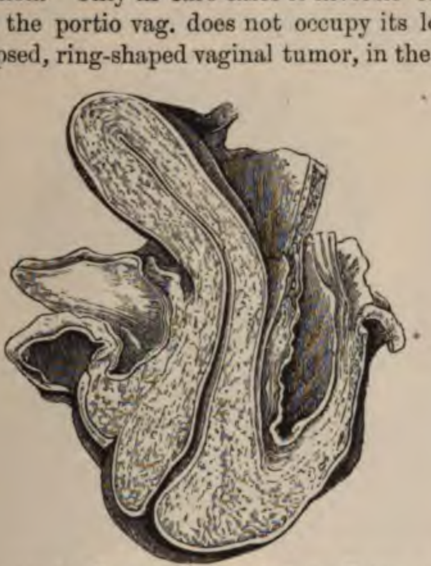
The operative treatment of vaginal displacement is the only one which is reliable, and is to be recommended in all cases when the patient is not too decrepit to undergo it. Its purpose is, if possible, to remove the conditions which caused the displacement, or, if that cannot be done, by keeping the protrusion in place, to prevent its growth. Thus the operations are very largely the same as those in vogue for the cure of prolapsus uteri. They all depend upon the following points:

1. The removal of the pressure or tension which maintains the protrusion.

2. The prevention of the relaxation and protrusion of the walls of the

though, in our experience, a not impassible hindrance to reposition. The portio vag. uteri is blended in with the walls of the tumor. This is due to the hypertrophy above-mentioned, and also, if the os is ruptured to any great extent, to the ectropion-like eversion of its lips. These, together with the other changes occurring in the mucous membrane of the portio vag. and the cervix, will be considered in connection with prolapsus uteri.

The symptoms of inversio vag. will consist of those of partial displacements together with those of prolapsus uteri The diagnosis also needs no further elucidation. Only in rare cases is inversio to be observed in the stage in which the portio vag. does not occupy its lowest point. It then forms a prolapsed, ring-shaped vaginal tumor, in the middle of which is a funnel-shaped orifice which leads to the portio vag. (Fig. 26.) This is the transition form between a prolapsus ant. and post. beginning at the lower segment of the vagina, and a complete inversion.



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It has been attempted to effect vaginal constriction for the cure of vaginal and uterine prolapsus by operation, and by bloodless methods. For the latter purpose cauterization and the ligature have been employed.

Various cauterizing agents have been recommended; but no one of them, not even the red-hot iron, has turned out to be trustworthy. Meding used nitrate of silver; Philipps nitric acid;[1] Dégranger chloride of zinc;[2] Langier,[3] Evory Kennedy,[4] Dieffenbach,[5] ferrum candens. Longitudinal or ring-shaped cauterization cannot be applied thoroughly enough to form deep eschars, from the danger of injuring peritoneum, bladder, or rectum. The resulting cicatricial contraction is therefore insufficient, and the method has been abandoned in spite of Dieffenbach's[6] encouraging remarks.

The tying of the prolapsus tumor or the hypertrophied portion of the vaginal wall was recommended by Richter,[7] and first successfully done by Hedrich[8] in a patient forty-four years old with an irreducible prolapse, the size of a child's head. The mass of the prolapse weighed one pound, and was removed in eighty-two hours without much bleeding or pain. Bellini[9] has described a modification of this process under the name of kolpodesmorrhapia. It consists of a submucous application of the ligating threads. Naturally it has found few adherents. The same may be said of the method employed by Blasius,[10] who gradually tightened a number of ligatures passed circularly through the vagina, so as to obtain a ring-shaped, constricting scar. Most recently Carl v. Braun[11] and C. von Rokitansky jr.,[12] have again employed the elastic ligature. But Braun noticed that the time of treatment even for small hypertrophies was longer than that required by excision, and that fever occurred once in twelve cases.

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[1] Lond. Med. Gaz., vol. 24, p. 494.

[2] Dresd. Zeitschrift f. Nat. und Heilk., 1830, New Series, vol. 1, part 2. Gaz. Méd. de Paris, 1853, Nos. 5 and 25.

[3] Lecture in the Acad. de Méd., Paris, Aug. 1835.

[4] Lancet, 1839, vol. 2, No. 12.

[5] Op. Chir.

[6] Chippendale has even proposed to inoculate the vaginal mucous membrane with gonorrhœal virus.

[7] Loder's Journal, vol. 7, p. 59.

[8] Neue Dresdener Zeitschrift f. Nat. u. Heilk., 1829, part 1, p. 179.

[9] Bulletino della Scienze Med., Bologna, 1836, November and December.

[10] Med. Ztg. d. Ver. f. Heilk. in Preussen, 1884; Dissert. von Stephan, Halle, 1884, and Beitr. z. prakt. Chir., p. 310.

[11] Lehrb. d. ges. Gyn., Wien, 1881, p. 322.

[12] Aertzl. Bericht des Maria-Theresa-Frauenspitales in Wien, 1877, Verlag von Urban u. Schwarlzenberg.

The combination of cauterization with mechanical procedures, the pincement du vagin of Dégranges with a toothed forceps armed with chloride of zinc,[1] and the extensive cauterization with lapis, with subsequent suture of the wounded surfaces recommended by Joubert,[2] are only of historical interest.

Mende[3] was the first to theoretically recommend, and Fricke,[4] independently of him, the first to execute an operation for the retention of these prolapses. Since their time this method of treatment has constantly grown in popularity.

Fricke's episiorraphy consists of a freshening and union of a part of the labia majora and a strip of mucous membrane between these points at the posterior commissure, thus constricting the vulva. But the pressure of the tumor was found to be too great for the weakened and thinned-out perineum, and the operation itself was not much more valuable than Dommes' plan of uniting the labia majora by means of a gold ring. Yet it has formed the groundwork for all subsequent improvements. Malgaigne[5] soon gave greater breadth to the median band which united the denuded labial surfaces; and Credé,[6] Keiller,[7] Baker Brown,[8] Küchler,[9] and Linhart have worked in the same direction. But as Hegar rightly says, all these modifications are only to be looked upon as improved episiorrhapies having for their chief aim the constriction of the vulva.

On the other hand attempts were made to freshen and unite the vaginal walls themselves, so as to narrow the vagina and at the same time to form a high column which would leave no room for a prolapse above it and would oppose any further descent of the uterus and the upper part of the vagina. B. Gerardin[10] seems to have been the first to do kolporraphy or elytrorraphy. Occasional excisions of the prolapsed tumor had been done before by Stalpart van der Wiel, Medren, and others; but only the hypertrophied mucous membrane was operated upon, and the operation was not methodically developed. The successful operations of Heming,[11] and

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[1] Mém. sur le traitement de la chute de l'utérus par le pincement du vagin (Gaz. Méd. de Paris, 1853, Nos. 5 and 25).

[2] Gaz. Méd. de Paris, 1840, No. 5.

[3] Geschlechts-krankheiten des Weibes, published by A. Balling, Göttingen, 1834, part 2, p. 51.

[4] Annalen der Chir. Abth. d. Allg., Krankenhauses in Hamburg, 1833, p. 142.

[5] Man. de Méd. Operatoire, 1837, p. 728.

[6] Casper's Wochenschrift f. d. Ges., Heilk. 1851, Nos. 14, 15, 16.

[7] On the radical treatment of perineal laceration. Lecture delivered before the Edinb. Med. Chir. Soc.

[8] On Surg. Dis. of Women, p. 99.

[9] The double or perineo-vulvo-vaginal suture, Erlangen, 1863.

[10] Harles, Rhein—Westphäl. Jahrbücher für Med. u. Chir., Hamm. 1825, vol. 10, pt. 1.

[11] Heming first operated in consequence of a suggestion made by Marshall-Hall in 1831 (Eng. translation of "Boivin and Dugés," by Heming, 1834, p.3).

of Ireland[1] first brought kolporraphy into general notice. The former freshened up the anterior wall of the prolapsus tumor; and the latter cut out a strip 1½ inches wide from the entire length of the vagina, and united it with sutures. Dieffenbach excised from each side of the prolapsed vagina oval flaps the size of a hen's egg, and united the wounded surfaces with sutures.[2] Later he advised the excision of elliptical and pointed areas 3 inches long by 2 inches wide; and when there was great laxity of the vagina a small segment of the anterior wall was to be removed also. He also recommended another method: the mucous membrane was to be denuded to the breadth of half an inch or more, and the strip to extend from the vaginal entrance to the collum uteri. No sutures were to be used, but the vagina was to be tamponed. These operations are for large vaginal inversions complicated with uterine prolapse. If the vagina alone is involved, D. recommends that the tumor be seized with a toothed forceps, a strong ligature applied in front of it, and then the tissues divided between the two. As many sutures as may be needed are applied to the surface of the wound. Though we would prefer to excise longitudinal areas, Dieffenbach says we will more commonly have to excise transverse folds.

There is often considerable venous hemorrhage when we ablate prolapsed vaginal folds, and a few small twigs of the art. vag. may spurt. When the whole base of the fold can be grasped by the toothed forceps, that instrument will be very useful; nevertheless we prefer to pass a number of silver-wire sutures instead of the silk ligatures above the forceps at once, so as to check the hemorrhage. C. V. Braun (l. c. p. 320) has recently recommended this procedure.

G. Simon[3] and A. Hegar[4] have done more than any others in Germany to introduce and systematize operative procedure for prolapse of vagina and uterus. After them many modifications and variations have been proposed, especially by Bischoff[5] and L. Neugebauer.[6]

As to the details of the prolapsus operation, they are fully considered by Fritsch in the part of this work dealing with uterine displacements, to which we refer the reader.

For the palliative treatment by retention of vaginal inversion, any of the ordinary pessaries and bandages used for uterine prolapse may be employed. We will not attempt to describe their innumerable varieties, since their choice depends largely upon the physician's prejudice or habit. Every one of them has some disadvantage. If the structure of the introitus vag. and the muscular floor of the pelvis allows the retention of pessaries within the vagina, they are always to be preferred to instruments which are in part worn externally; the latter being less convenient and being liable to cause great irritation of the vaginal entrance. And also they retain the vagina in place by maintaining it in a state of tension above the diaphragma pelvis. If the introitus is so dilated by relaxation, diastasis or loss of substance of the muscular and aponeurotic base of the pelvis, that a pessary can find no vaginal support, they may still be retained if certain conditions are present. Thus peculiarities in the shape and width of the pelvis (funnel-shaped pelvis), or of the form of the pessary (large lateral wings), may enable the instrument to rest against the bony walls of the pelvic canal. It is very well known that under these conditions of continuous localized compression of the soft parts between a hard instrument and the bone, evil consequences will soon ensue; and it does not seem proper to me that we should continue to gather renewed experience upon the subject.

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[1] Dubl. Journ. of Med. Science, January, 1835, p. 3.

[2] Med. Zietung d. Ver. für Heilk. in Preussen, Berlin, 1836, No. 31, and Die Operative Chirurgie, vol. 1, p. 642.

[3] Prager Vierteljahrsschrift f. pr. Heilk., 1867, vol. 95; and Engelhardt, Die retention des Gebärmuttervorfalles, Heidelberg, 1871.

[4] Hegar und Kaltenbach, l. c., und Hüffel, l. c.

[5] H. Banga, Die Kolpoperineo-plastik nach Bischoff, Diss.-Basel, 1875, and Egli-Sinclair, Corr.-Bl. f. Schweizer Aerzte, Year, 1877.

[6] Centralblatt f. Gyn., 1881, p. 3.

But in any case the maintenance of the replaced vagina above the diaphragma pelvis necessitates an amount of tension of the vaginal walls which cannot be attained with most pessaries without a deleterious amount of local pressure. The more irregular these instruments are in their shape, the more certainly will they cause uneven pressure at certain places. Often we find that pessaries which have been introduced whilst the pelvic organs were in a state of rest, have assumed a different position shortly after being placed. Elongated and winged instruments readily get into crooked positions, and cause contusion and friction; and these lead in time, if carelessly left to themselves, to ulcerations and deeper pressure-necroses, and even to perforations

Yet, though these accidents have occurred time and time again, they have not been sufficiently noticed in medical circles; and even yet the introduction of a "womb-ring" is oftentimes looked upon as a trivial matter, to be relegated to the midwife. I have seen so much evil result from neglect of this kind that I do not deem it superfluous to say a word of warning in regard to the introduction of pessaries. In addition to the ordinary treatment of the complicating erosions and ulcers, the following precautions should be observed:

1. The pessary should be chosen in accordance with the width of the vagina. It should be introduced in the knee-elbow position, and after the prolapse has been thoroughly reduced, and the vagina filled with air. It slips easily into the dilated sac, when it finds plenty of room. Now, with its opening encircling the portio vag., it is kept pressed against the posterior vaginal wall, and against the fornix, whilst the patient gradually

raises herself into a kneeling position. The stretching of the posterior vaginal wall at the moment of rising prevents the sinking forwards of the collum, and the descent of the movable adnexa and the intestines into Douglas's *cul-de-sac*. Very often we thus effect an anteversion of the uterus; a position most favorable for retention; and we will frequently prevent painful pressure upon an ovary which may be lying in Douglas's *cul-de-sac*.

2. We should never rest satisfied only with an immediate examination as to whether the pessary remains in place well when walking, standing, and bearing-down; we should always examine the patient again next day, after she has been moving around for some time, and has had a passage.

3. Vaginal injections of lukewarm water, either plain or containing antiseptic agents, must be used twice daily, so as to prevent stagnation of the catarrhal secretion which the presence of the foreign body will always occasion.

4. A soft rubber ring should never be worn longer than eight weeks; and one of hard rubber should be removed and cleansed at least once in that period of time, though it may be worn much longer.

I know of but a single case in which a pessary was worn continuously for years without any evil consequences ensuing, though the patient did not trouble herself about it at all. I was asked to remove it for a trouble in no way connected with that of the womb, and was told to replace it again. I removed with difficulty, on account of its size, a yellow ball of wax as big as a large orange with the help of a polypus forceps. It had exerted a moderate and even tension upon the vaginal walls; and, from its smooth surface and indifferent nature, as well as from the complete exclusion of air from the vagina which it ensured, there was so little irritation that although the portio vag. was softened and injected, there was neither erosion nor any other tension.[1] The case led me to remark in 1879, in the 1st edition of this work: "The hard rubber balls which Bozemann uses for the preparatory dilatation of the cicatricial vagina, before operating for vesico-vaginal fistula, seem to rank next to those of wax in respect to the small amount of irritation they occasion. My experience with them is as dilators, not as pessaries; but I think they might well be occasionally used as such."

Of late years I have made great use of the so-called egg pessaries for the palliative retention of vaginal and uterine prolapsus, especially when they are of long standing, and in women who have passed the climacterium.[2] They consist of light hollow pessaries of hard rubber, of various sizes and egg-shaped.

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[1] Göckel (Miscell. Nat. Cur. du II. den V. obs. LIV.) relates a case where a woman carried a wax ball over 6 ounces in weight, and a copper ball 2 ounces in weight for 27 years as a uterine support (from Voigtelle, l. c.).

[2] Prager Med. Wochenschrift, 1884, No. 33.

The even and moderate tension of the vaginal walls which they occasion, the stability with which they maintain their position over the muscular pelvic floor, the exclusion of air, combined with their smooth surface and indifferent material, render these pessaries the most desirable of all, and the ones which entail in the least degree the evil consequences due to the presence of a foreign body.

For their removal I use a small pair of forceps made especially for the purpose, if they are so firmly seated that they cannot be expressed by abdominal tension. I would refer the reader for fuller particulars in regard to these pessaries to the communication referred to above, and will only state here that I have several times had occasion to use them in women who were still menstruating, and have had abundant proof that they in no way interfere with that process. Nevertheless this form of pessary puts a stop to sexual intercourse, and it is applicable especially to women at the ages at which involution of the sexual organs has occurred.

When there is not sufficient support for pessaries, bandages may be used. They should press upon and irritate the parts as little as possible, should not interfere with the motions of the body, and should be readily introduced and easily cleansed. And withal they must not be too expensive; for not only must they be within the means of the working classes, but the intra-vaginal part, at least, must be frequently changed.

I will not describe these appliances in detail, since that will be done under the heading of prolapsus uteri. I will only say that I myself employ a simple T-bandage with elastic insertion, to the middle piece of which a smooth, hard, rubber, pear-shaped pessary is attached by means of a stout gutta-percha stalk."[1]

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[1] Aerztl. Bericht. des Allg. Krankenhauses, zu Prag. 1876.

CHAPTER V.

RUPTURES OF THE VAGINA.

RUPTURES of the vagina may be due to traumata, or may occur spontaneously. Usually there is tension and stretching of the walls of the canal up to the limit of distensibility; or sharp or pointed bodies may penetrate from without.

Among the traumatic causes of the accident are falls upon the genitals and the entrance of foreign bodies (see under that head). Reckwitz saw a vagina that had been ruptured by the horn of a bull, and Curran records a recto-vaginal tear from penetration of the horn of a goat. I have seen 2 cases of complete perineal rupture into the rectum in young girls; the one was caused by the breaking of a wooden sled upon which she was straddling and sliding down hill; and the other was caused by the horn of a cow. It may well be doubted if violent coitus can cause a fatal rupture when the vagina is in normal condition, although Diemerbroeck, Colombat, and Meissner record such cases. If senile involution, and pathological changes such as stenoses, etc., are present, rupture might occur from intercourse; I have myself seen such a case, which, however, recovered. Hymenal ruptures of some depth, which may bleed considerably, are often made by defloration, and are not to be looked upon as vaginal ruptures. It has lately been denied by E. Hofmann[1] that the severe vaginal lesions which have been seen in certain cases of rape upon children have been caused by attempts at coitus; he claiming justly that they were more probably due to rude manipulation. Maschka[2] expresses a similar opinion Finally, instruments, and even the hand of the physician or the midwife, may tear and even rupture the vagina, most often during childbirth. More rarely this has occurred during violent attempts at the reposition of chronic inversio uteri, the extraction of large utero-fibromata, etc.

The location and extent of the ruptures vary greatly, in accordance with their cause. As in all wounds which do not immediately destroy organs necessary for life, the two chief factors of hemorrhage and infection will decide the result. Fatal hemorrhage is comparatively rare in vaginal rupture; when it has occurred it has been in pregnant women, and has been near the introitus and involved the erectile tissues. Complications, such as the opening into neighboring organs or the peritoneum, always make the wound a dangerous one, but are not necessarily fatal unless very considerable hemorrhage or septic infection occur. We can nowadays better understand the isolated and apparently wonderful cases of recovery after such injuries; though there are some in which infection did not occur, although the patient was most unfavorably situated. Thus, Reckwitz had a case in which the lower portion of the vagina, one inch above the introitus, was torn in three places, and the patient recovered after the wounds were sutured. Colombat[1] relates a case of recovery after the posterior vaginal wall of a young girl had been pierced by an iron pitchfork, in jumping from a hay-stack; and Rey records the recovery, after fourteen days, of a case where a long wooden rake had penetrated the peritoneum through the wall of the vagina. Ruhfus[2] saw the intestines protrude through the wound after withdrawing a pitchfork which had penetrated the posterior vaginal vault. He replaced them, although they had already become cold, and held them *in situ* with a sponge soaked in oil. The patient was kept upon her back with the pelvis elevated, and "antiphlogistic treatment" ordered; and she recovered. Fleury[3] records a more recent case in which a fall from a grain wagon against a piece of wood caused rupture of the anterior vaginal wall and the bladder, and which healed of itself. The cases to be related later, in which large ruptures of the posterior vaginal vault occurred *post-partum*, are still more remarkable.

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[1] Lehrb. d. Ger. Med., Wien, 1877.

[2] Handb. der Gerichtl. Med. 1882, vol. 3, p. 164.

The spontaneous ruptures of the vaginal walls occur almost exclusively during childbirth, although a few cases have been observed under other conditions. Thus Grenser[4] reports that in a pregnant woman with ascites the first-sized retroverted uterus prolapsed through a spontaneous rupture of the posterior wall of the vagina, and appeared at the vulva. The fatal result was hastened by the attempts made by a surgeon who was called in to remove the prolapsed body, which he took to be a mole. Samples (l.c.) reports a case of spontaneous rupture of the posterior vaginal vault in a woman who violently exerted herself some three months *post partum*. The finger could be passed into a cavity which had no connection with the peritoneal sac. Pallen closed the rupture with a few sutures, and the patient got well. The physician suspected, probably correctly, that the rupture had been caused by the bursting of a hæmatoma.

Fehling's[5] remarkable case is probably partly traumatic in its origin. The woman was sixty-three years old, and had had eleven deliveries and one abortion. For fifteen years she had had a prolapsus which had been left to itself. One day, after going up to the fourth floor with a pail of water, it protruded very greatly, and she attempted to replace it forcibly with her hands. A fatal rupture of the posterior vaginal wall, with prolapsed coils of intestine, occurred. The history of this case furnishes us with a key to a similar condition, which Rokitansky[1] once found *post-mortem.*

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[1] Trait. d. Malad. d. Femmes, Tome II., p. 424.

[2] Gräfe u. Walther's Journ. f. d. Chir., vol. 5, part 3.

[3] Annales de Gynécol., 1877, Tome VIII. p. 457.

[4] Naturforscher Vers. in Wien, 1856 (Monatschrift f. Geburtsh. vol. 9, p. 73).

[5] Arch. f. Gyn., vol. 6, p. 103.

In these cases the traumatic influences were slight, and they may be placed by the side of the spontaneous cases. They presuppose an excessive friability of the vaginal walls from a pathological process of some kind, together with a sudden increase in vaginal tension from ascites, retroversio uteri, or hernia post. vag., etc.

Now as to vaginal ruptures which occur *sub-partu.*

They occur both with natural and with artificial deliveries. If we do not include the very frequent fissures of the mucous membrane at the hymenal insertion, which occur in most first deliveries, vaginal ruptures are rare accidents in childbirth. In 108 cases of rupture M'Clintock counts 35 as affecting the vagina especially.[2]

We can easily appreciate the conditions which predispose to vaginal rupture in childbirth. The excessive tension and stretching of the walls is the prime factor, especially when there is any disproportion between the advancing part and the vaginal tube. An unequal amount of tension is therefore exerted; sometimes spontaneously by abnormal positions of the head, but much more frequently from a faulty direction of the forceps in extraction. As a rule the posterior wall, being the one most subject to tension, is the one that is ruptured. The rapidity with which the vagina is dilated is a factor, as is also the condition of the vaginal tissue as regards extensibility. Deep fissures at the upper and lower segments of the tube generally involve the neighboring organs. Thus ruptures of the vaginal vault usually involve that of the cervix uteri; those near the vaginal entrance are continuous with perineal rents. But we do see uncomplicated fissures at both places. Those of the vaginal vault then often form transverse tears, and sometimes spread so far in a circular form as to completely separate the uterus from the vagina. Hugenberger, who has described this variety of rupture minutely under the name of kolpoporrhexis,[3] has collected 39 cases, the 40th occurring in his own practice. Seventeen of them were anterior, 17 posterior, and 6 more or less complete separation of vagina and uterus. Like uterine ruptures, they occurred most frequently in multiparæ, in whom there was marked disproportion between pelvis and fœtus. In either case the essential cause of spontaneous rupture is the enormous stretching and tension of the cervical and vaginal walls, which occurs when there is an impassable obstacle, and the internal os is behind the head or other prominent part of the child. This mode of origin was described by Crantz, though G. A. Michaelis was the first to thoroughly study it.[1]

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[1] Lehrb. d. Pathol. Anat., 3d ed. vol. 3, p. 515.

[2] Comp. Speigelberg, Lehrb. d. Geburtsh., p. 619.

[3] L. c.

Michaelis found in eight cases of rupture which he observed, that the vagina was always solely or especially the part involved. Bandl[2] has proven the same origin for the more frequent cervical ruptures of the uterus, though he improperly denies the validity of the generally accepted explanation of vaginal rupture. Next to this the commonest cause is the exceptionally great extension of the vagina above an unyielding stenosis; this we have already mentioned when considering vaginal stenoses. (E. Kennedy, Doherty.) Ruptures from pressure of the soft parts between the child's head and pelvic prominences can probably only occur when the vagina has been enormously stretched and there are exostoses springing from the promontory or the sharp edge of the pecten pubis (Lehmann), or most commonly, the symphysis. It might also occur from too great prominence of the ischial spines, or from badly united fractures of the pubis, with displacement and a large amount of callus.

We do not set any very high value upon spasmodic uterine contractions, or the influence of ergot as causes of rupture, though they have been much dwelt upon by the older authorities. We cannot in any of these older cases exclude the possibility of a want of proper mechanical relationship between the pelvis and the fœtus; and more recent confirmatory observations are wanting.

Finally, pathological changes in the vaginal walls themselves may give rise to spontaneous ruptures *sub partu*. Hugenberger found two such among his forty cases; there being in one case stenosis and in another case large cicatrices from antecedent and successfully operated upon fistula ves. vag.

Ruptures of the vaginal vault are frequently penetrating. Hugenberger found thirty-four of them so; while in two cases the peritoneum was preserved and only elevated by extravasations.

The symptoms are very like those of cervical ruptures of the uterus. There is sudden pain, distinctly localized hypogastric tenderness on pressure, increasing abdominal distension, collapse even with but slight external hemorrhage, sometimes cessation of the pains, change of shape of the lower abdomen from partial or complete extrusion of the fœtus through the rent, and the occasional formation of a hæmatoma. These are the symptoms which are common to both affections. Vaginal ruptures can often be directly reached with the fingers; if they affect the anterior wall, the entrance of air will occasionally cause emphysematous crepitation above the symphysis. (M'Clintock, Hugenberger.) Protrusion of the presenting part of the child does not follow vaginal as frequently as it does uterine ruptures. Thus in Hugenberger's cases the head remained seventeen times and the breech once in the pelvic canal, even when, as sometimes occurred, other parts of the child were already within the abdominal cavity. Hence it happens that the external hemorrhage is sometimes very slight, the parts of the child preventing outflow. Nevertheless, all these signs are not sufficient to enable us to make a diagnosis of vaginal rupture before the child is born. Feeling the lower border of the rupture will only enable us to decide that the vagina is involved. We can only ascertain the facts after the uterus is empty.

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[1] The Contracted Pelvis, Leipzig, 1851, p. 208.

[2] On ruptures of the uterus and their mechanism, Vienna, 1875.

As regards their course and termination, vaginal ruptures occurring high up *sub partu* in most cases terminate fatally from hemorrhage, shock, or peritonitis septica, like similar ruptures of the neck of the uterus. It is usually not in our power to control the conditions necessary for an aseptic course. Yet the prognosis is better than that of uterine rupture. Hugenberger calculates from the reports of the large European lying-in institutions, that the mortality of the latter class of cases is 95 per cent., while in 40 cases of kolpoporrhexis 11 recovered, although 9 of them were penetrating ruptures.

Deep ruptures during labor of the median segment of the vagina probably only occur spontaneously when stenosis is present. Traumatic ruptures, also, are rare, though as elsewhere they may occur from the use of instruments or from pieces of bone in difficult extractions. Spiegelberg mentions a case in which a large fold of the anterior vaginal wall was seized with the part, and an opening torn into the vesico-vaginal septum.

As to ruptures at the introitus, the passage of the child's head is most likely to cause it at the tensest part, the posterior wall. They regularly begin at the narrowest part, where the hymen is inserted, and run to the entrance of the vagina. (Kiwisch.) They therefore occur most commonly in primiparæ. The mucous membrane first gives way, on account of the excessive circular distension, in a longitudinal direction. The tear then continues, boring into the deeper strata, either upwards as a longitudinal fissure, or, combined with a transverse rupture, it attains a Y or W-shape, depending upon whether it is continued in the direction of the raphe perin. or not. As a rule longitudinal ruptures at the vaginal entrance do not run exactly in the median line; they always go to one or the other side, since the columna rugarum post. is always more resistant than other parts. The columna also limits the transverse ruptures of the introitus. But apart from these features, due to the anatomical peculiarities of the parts, the ruptures may vary much in shape, especially when the tissues have been contused and are sugillated. We then often find the ruptures continued into the perineum. Transverse fissures of the introitus may also be continued into the depths of the perineal tissue, without there being any longitudinal rupture of that structure.

I do not know of any prolongation of transverse ruptures of the vaginal entrance into the rectum; but I do not doubt that they do occur, especially when they are met by a rupture of the rectal mucous membrane. For when the perineal portion of the vagina is greatly distended, a primary longitudinal rupture of the anterior rectal mucous membrane occasionally occurs. In two such cases of fissures 1.2 inches long of the rectal mucous membrane, which I saw not long ago, I was able to prevent deeper vaginal rupture by free lateral incision of the vulva, and by relieving the perineum by lifting up the head per rectum. The rectal lesion healed quickly after suturing.

Fissures of the anterior parts of the introitus are never so extensive or so deep as those of the posterior portions. This is to be explained by the fact that when the head is passing, the longitudinal extension of the anterior wall is less than that of the posterior wall; and the fixation of the urethro-vaginal septum to the pelvic fascia is such as to admit of but little movement; and finally, that the arch of the pubis protects the anterior vaginal wall from hyper-distension. Thus the greater part of the tension falls upon the more yielding posterior segment. But in spite of this there do occur longitudinal ruptures of the anterior wall, which may be continued to the vestibule, or more rarely, to the nymphæ. They may be of exceptional importance on account of the dangerous hemorrhage which may occur from the tearing of tissues so near the urethra and clitoris. They will be considered elsewhere. A narrow vulva, a rigid perineum, and a hindrance of the descent of the occiput will especially favor their occurrence.

If the vaginal tube is small, and the pains severe, longitudinal ruptures of the vaginal mucosa may occur which may involve the entire length of the organ, and yet not invade the deeper strata. I myself saw in a peasant girl, who had just been delivered of her first child under very insufficient care in the country, and who desired to become a wet-nurse, a fresh linear scar running from the posterior vaginal vault to the commissura post. This spontaneous cure was an excellent recommendation for her as wet-nurse, and she did her duty well.

In regard to the prognosis of vaginal ruptures, the following points are to be considered:

1. The hemorrhage. 2. Complication with injuries of neighboring organs. 3. Infection. These will decide as to the dangers to life, as well as to the possibility of a restitutio ad integrum in case of cure. In complicated injuries the latter will only exceptionally be attained. Fistula of rectum and of bladder, deforming scars, atresias and stenoses, descents and fixations of the uterus, are often left behind.

Infection is of the greatest importance for the prognosis, since occasionally, and very especially in childbed, slight traumatic losses of tissue may prove fatal. For in addition to the possibility in all vaginal ruptures of the access of septic material from without at the moment of injury and later, we have here two additional dangers—traumata during childbirth often cause extensive losses of tissue from contusion, and the wound is inevitably kept bathed in the decomposing lochial secretion.

The treatment may be prophylactic in a certain number of vaginal ruptures, mainly in those occurring *sub partu*. This presupposes that symptoms of the approaching danger of rupture are recognized; which has been found possible in many cases. Since spontaneous ruptures high up in the vaginal vault occur under precisely similar conditions as do cervical ruptures, the prophylactic treatment of the two are identical. When in cases of disproportion between the pelvic entrance and the advancing head, that contraction of the region of the uterine tumor corresponding to the internal os over the child's head, to which Bandl has drawn attention, has formed, the vagina itself will be markedly stretched, and is, with the cervix, in danger of rupture. But even when on account of an abnormal presentation, the constriction of the orif. int. is not plainly marked, or when the contraction of the orif. ext. has gone so far that the cervix has safely passed the point of greatest tension, the stretching of the vagina over the advancing part may yet show that there is danger of rupture

And prophylaxis would here consist not only of the avoidance of all procedures which would increase the tension, and in the combating of very violent pains by narcotics, but also in the relief of tension by operative procedure.

In cases of stenosis, the incisions of which we have already spoken are available to prevent rupture. When the obstacle is situated at the vaginal entrance, we may endeavor to enlarge the vulva by lateral incisions, at the same time endeavoring to guide the head and shoulders through the introitus in the most favorable way. When the head is in its normal position, this latter indication will depend chiefly upon the complete descent of the occiput and on the slow advance of the head during this movement of flexion. In my experience this can be most successfully done by the method of bi-manual protection of the perineum, the one hand taking care of the descent of the occiput, while the other by pressing against the perineum during the pains, prevents the too rapid passage of the head. During the remissions of the pains the tips of the fingers should be pressed against the ischial regions, so as to favor the rotation of the head. I have abandoned Ritgen's method of guiding the face from the rectum for antiseptic reasons.

If rupture has already occurred, we must endeavor to control the hemorrhage; and, after thoroughly cleaning the wound, try to unite its edges with sutures. If this cannot be done, we must simply dress the wound and put it in as favorable a condition as possible.

If the injury has been caused by a foreign body, it must be removed with the precautions I have described. Under all circumstances a careful cleansing of the wound and a minute examination is necessary. Irrigation is our best method of cleansing in non-penetrating wounds, and it alone will often stop the hemorrhage. If larger vessels have been injured, they are almost always veins; cold and pressure will usually control the hemorrhage. But sometimes it will not do so. Then it will depend upon the nature and the accessibility of the wound whether the hemorrhage can be stopped by union of the edges of the wound, or whether temporary pressure-sutures should be passed. In any case compression by sutures is not only the surest way of controlling hemorrhage, but it is also the one which interferes least with primary union of the wound. If the rupture can be closed with sutures, irregular edges are to be trimmed off and the edges of the wound carefully united with wire or thread. Then complete rest should be enjoined, with cold cloths to the genitals and hypogastrium, a diet that does not give much fæcal residue, and the use of the catheter. If there is much vaginal discharge, lukewarm vaginal injections should be taken several times a day, (alum. acet. with addition of spir. lavand., or one of the various antiseptic solutions), always under very slight pressure, and without the injection tube immediately touching the wound.

Sutural union can occasionally be done even when there are severe complicating injuries, and is then always indicated. Naturally it must be carefully effected, though in an emergency operation; the couch, instruments and assistants must be specially prepared, the wound being meantime provisionally attended to. Without doubt much will depend upon external circumstances, and much upon the energy of the physician.

If sutures cannot be applied, tampons soaked in an antiseptic fluid, or better, compresses of iodoform gauze, must be applied after the hemorrhage has been controlled, and the whole fixed with a T-bandage. The length of time which the tampon is permitted to remain *in situ* depends partly upon the material of which it is composed, and partly upon the amount of vaginal distension which it occasions. If it causes much distension it must not be left in place many hours; iodoform tampons remain aseptic longest. In penetrating ruptures with prolapse of the internal organs (uterus, adnexa, coils of intestine), the latter must be carefully cleansed, and replaced, even when they have become cold, since several cases of this kind have recovered. In these cases the collapse and the gaping of the wound usually prevent suture. The prime indication after replacement is to prevent intestinal protrusion by suitable tampons. The remarkable case which Breslau has described, where a midwife and a bathman succeeded in removing the uterus, tubes, and ovaries of a recently delivered woman with their fingers and nails, show that recovery may take

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[1] De totius uteri extirpatione, Dissert. inaug., Monachii, 1852. Even this case is not unparalleled.

place in high cervico-vaginal ruptures, and the intestines be retained even when the entire uterine body has been taken away.

And now as to the best method of completing delivery in large and high-seated vaginal ruptures occurring *sub partu*. Our choice between laparotomy and extraction will depend upon the amount of disproportion between the fœtus and the pelvis or soft parts (stenoses, tumors, etc.), and also upon the extent of fœtal prolapse through the rupture. In a general way we can refer to the rules laid down for uterine ruptures, which are mostly applicable here.

If there is not too great a want of proportion between the fœtus and the pelvic canal, and if the rupture is large and the child is wholly or mostly within the abdominal cavity, turning and manual extraction may be done. If the rupture is small, and the fœtus wedged in the uterus, perforation and cranioclasis may be employed. The after-birth is to be removed immediately after the fœtus, so as to put an end to hemorrhage and give rest to the injured parts as soon as possible. Coils of intestine are to be replaced, and a bandage employed as directed above. Since union by suture is but rarely practicable, hemorrhage and displacement must be combatted by externally applied cold (ice-bags), a suitable position, and as complete an immobilization of the wound as is possible by means of the dressing. If the uterus is well contracted, and the hemorrhage still persists, the bleeding point must be searched for as soon as it can be reached, and ligatured. In order to prevent lochial stagnation over the wounded region we must not allow the first tampons to remain *in situ* over twenty-four hours. It is desirable, in order to secure as complete rest for the wound as is possible, to limit our vaginal antiseptic injections as much as possible. Where, from septic changes, they become necessary, they should be done without employing too great pressure and without disturbing the patient too much.

As we have said, general treatment consists chiefly in the exhibition of analeptics. Alcohol in small doses may be indicated, and considerable quantities of opiates may be necessary for the pain and restlessness.

There can be not the slightest doubt that delivery *per vias naturales* under all circumstances enlarges the rupture and renders the prospect of recovery very faint. But unfortunately our experience so far does not seem to render it probable that laparotomy, which Trask[1] has so sturdily advocated for uterine ruptures, will do much better. For we never succeed by laparotomy in controlling the rapidly advancing septic infection. Our best prospects lie in putting the wound in such a condition that its secretions can flow off undisturbed. This is to be accomplished by the position of the patient, drainage and local antisepsis, with complete rest, immobilization of the uterus and light compression of the abdomen by

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[1] Amer. Journ. of Med. Science, January—April, 1848.

means of a suitable bandage, with counteraction of the collapse by wine, etc. Ruptures of the middle and lower segments of the vagina are always accessible, and can be sutured if they are not situated behind stenosed areas. They can be well exposed in the dorsal position, with the hips elevated, or on the side, with the duck-billed speculum and depressor, aided by sharp hooks. The sutures should be begun at the posterior angle. Many operators employ carbolized silk, or catgut, which need not be removed later. There is no objection, however, to wire sutures; they are to be removed in fourteen days, and though this may be difficult to do, it can always be accomplished. If the rupture is situated behind a stenosed tract, and cannot be seen, the hemorrhage must be stopped by injections through the double catheter, or by the introduction of small pieces of ice. If we must use tampons, those of iodoform gauze are the best. Liq. ferr. sesquichlor. is occasionally useful, but should only be employed after other methods have failed. For the special considerations in regard to ruptures at the vaginal entrance and perineum, we must refer the reader to the section upon diseases of the external genitals.

CHAPTER IV.

HÆMATOMA OF THE VAGINA.

HÆMATOMA (thrombus) of the vagina is of rare occurrence. In the recorded cases of the affection there is no distinction made between vaginal and vulvar hæmatomata. But hæmatoma of the genitals in general is very rare; and Winckel, calculating on the basis of 50,000 births, says that there occurs only one in every 1600 cases. Bidder and Sutugin found only one hæmatoma limited to the vagina in 3285 childbirths. In my clinic in Prague there has been one case of hæmatoma vag. in 2126 births. Spath saw in two years at the clinic four cases of thrombus vag. in 6000 deliveries. (Wucher.) They do not differ in regard to their mode of origin from hæmatoma of the external genitals. Both probably occur but very rarely save in pregnancy, and then only in consequence of direct traumata. All the cases of which I have a history were primiparæ, and several of them were old ones. The posterior wall was usually affected, though sometimes the tumor was seated on the anterior wall. Once only did I see the entire length of the vagina affected.

The hyperplasia, loosening of tissue, and vascularization which accompany pregnancy, furnish the predisposing causes. Varices are not necessarily present. Marked and suddenly increased venous stasis from abdominal pressure will sometimes alone cause extravasation in pregnant women; but traumata are often the cause in spontaneous or artificial deliveries. This may be due, like the hæmatomata of pregnancy, to increase of pressure in the veins of the vaginal wall involved; or from so great a local contusion of the vessels that pressure-necrosis and subsequent hemorrhage occurs; or, probably most frequently, from direct rupture of the vessels from tension and displacement.[1] In the latter case the displacement and compression of the vaginal walls by the child's head explains how it is that the blood-tumor only developes *post partum.*

There have been too few investigations made as to the immediate origin of the hemorrhage for us to decide as to their anatomical relations. In any case the veins will be more exposed to pressure and subsequent stasis than will the more elastic arteries. The hemorrhage is usually freer than would come from capillaries, and has no systolic impulse; hence it is most probably venous. Of course, however, smaller arterial twigs may be involved.

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[1] Perrot (Thèse 1864, cited by Charpentier, l. c.) long ago recognized the importance of displacement of the vaginal walls upon the sub-mucous recto-vaginal connective tissue in the formation of hæmatoma. Freund, by his explanation of the behavior of the various sections of the vagina during the birth of the head in his treatise upon ruptures of the vagina, has recently thrown much light upon the subject.

The tumor always forms rapidly. In pregnant women, if there has been no traumatism, it appears after exertion, a fit of coughing, or other action which involves a sudden abdominal pressure. During childbirth it only exceptionally appears before delivery is complete; as a rule it forms either immediately thereafter, or in a few hours or days, exactly as does hæmatoma vulvæ. The symptoms depend upon its seat and extent. A part of the tumor usually appears as a bluish-black or bluish translucent tumor; it will not be seen, of course, when the hæmatoma is small, or is confined to the upper segment of the vagina. Occasionally there is œdema of the vulva. As a rule there is sudden hypogastric pain, a feeling of bearing-down, and, when the tumor is large and affects the posterior wall, painful attempts at defecation. Symptoms of acute anæmia, fainting, and collapse have been observed a number of times, especially when the hæmatoma formed while external hemorrhage was in progress.

If in addition to these symptoms there are those of tension and separation of the walls of the septum recto-vag., with elevation and anteflexion of the uterus and dragging upon the walls of the rectum, the trouble may become very great, and the pain far exceed that which attended the precedent delivery. The course of vaginal hæmatoma is usually to a spontaneous rupture, and, with appropriate treatment, generally terminates in recovery. But repeated hemorrhages, and suppuration of the contents of the sac, with septic infection, may occur. The dangers of vaginal hæmatomata are greater than those of the vulvar form, inasmuch as the tumor spreads more rapidly to the parametrium and thus causes pelvic thromboses and recto-vaginal fistulæ.

There is no difficulty in the diagnosis of vaginal hæmatomata. Even if the tumor remains hidden in the vagina, it is easily accessible to the finger and can be well exposed with the Sims speculum. Once exposed to view, its smoothness, softness, and hemorrhagic discoloration are characteristic. As a rule the tumor is broad-based; but Fehling, Reich, and Anderson, as well as I, have seen some which were provided with a kind of pedicle; the columna rugárum, or a rudimentary septum vaginale, being the seat of the tumor. The sudden origin of the mass, and the presence of the above-mentioned characteristics, will complete the diagnosis, if that be necessary. Not infrequently the nature of the tumor is rendered plain by certain parts of its walls being thin, or even being ruptured, so that the contained blood can be easily seen.

In regard to treatment, we will be careful to follow here also the general rules laid down for hæmatomata of the genitals. Incision should not be done unless necessary, and any openings which may exist are to be used for the removal of coagula. This can often be accomplished by simply compressing the mass between vagina and rectum. But incision may become necessary. If the tumor forms an obstacle to delivery, or if the tension it causes gives rise to too much pain, it should be done; as also when the tumor is no longer increasing in size, and the coagula are undergoing septic decomposition from infection through the ruptured places or in some other way, and the orifices present are not sufficiently large to permit free outflow.

The danger of setting up renewed hemorrhage is greater, of course, the earlier an incision is made; and is not entirely absent even in cases several days old. If, as will in very exceptional cases be the fact, a spot in the ruptured tissue can be seen with the speculum, on compression of which the hemorrhage stops, it should be at once ligated. Usually, however, we must rely upon compression of the sac after it has been thoroughly washed out and disinfected. It is to be remembered, however, that a too firm tamponing may stretch the vagina too much; and that, besides being unreliable, it will not be borne by the patient. If the opening into the sac is large, small pledgets of absorbent cotton attached to strings, and steeped in styptic solutions (liquor ferri), or strips of iodoform gauze may be introduced directly into the sac; and they can be retained *in situ* by vaginal tampons, while a T-bandage with a hypogastric compress may help to fix the uterus. When the hemorrhage has definitely ceased, we must turn our attention to the prevention of the stagnation of the accumulated secretion in the vagina and the blood sac. For this purpose antiseptic injections are best, with antiseptic tamponade between times, to favor contact and union of the walls of the sac.

CHAPTER VII.

THE INFLAMMATORY AFFECTIONS OF THE VAGINA.

PRELIMINARY REMARKS.—The task of giving a satisfactory description of the inflammatory and infectious disorders of the vagina is rendered difficult by the fact that our pathologico-anatomical knowledge of these affections is still too incomplete for us to have a certain anatomical basis for all the clinical forms. Various circumstances, which have been, and still are, active, suffice to explain our slow rate of progress in this field. Even the minuter structure of the healthy vagina, and the occurrence of glands and lymphatic follicles in it, are subjects which yet occupy anatomical investigation. In addition to this, suitable material is difficult to obtain, and portions of tissue excised during life, such as C. Ruge used so much and so successfully, are at the disposal of but very few investigators. Hence but very few anatomists have worked upon this subject; and all the more recent and exhaustive work in it has been done by C. Ruge and H. Eppinger.

Since their time, however, our knowledge of several infectious diseases has been much extended by Neisser, Fehleisen, and others upon the basis of Koch's method; and histological investigation has been enriched by many technical discoveries. Hence the task of the anatomical investigation of vaginal diseases has been enlarged, and the material at our disposal needs revision in more than one respect. For one of the most important of the infectious diseases of the female vagina, gonorrhœal catarrh, this has been done by E. Bumm in his studies upon the gonococcus. H. Chiari also has investigated the relations of vaginal air-cysts with the improved methods, and has reached new results. But a number of very important questions still remain unanswered in this field; and we are not in the possession of an undisputed anatomical basis for inflammatory and infectious vaginal diseases. Therefore in their description and classification we will for the present adopt a clinical standard, and consider the pathologico-anatomical data separately.

The inflammatory diseases of the vagina usually affect the mucous membrane (vaginitis), the deeper layers of the vaginal walls being but infrequently and subordinately involved. In exceptional cases they chiefly affect the peri-vaginal connective-tissue layers (peri-vaginitis.)

Vaginitis most commonly appears as a catarrhal inflammation. It is seen in various forms according to its cause, to the extent and duration of the process, and to the condition of the vaginal mucous membrane as regards evolution or involution (gravidity, puerperium, senility); but it may also be exudative, croupous, diphtheritic, etc.

Since Rokitansky[1] this has been the usual division of vaginal inflammations. It is not quite an accurate one, since transition-forms occur, and there is an etiological relationship between the two. But we have retained it because it enables us to classify the different forms of inflammation, and because there are clinically a number of important differences between the groups.

In general the first includes the milder, and the second the severer inflammations. In catarrhal vaginitis we do not have the coagulable exudation and the superficial tissue necrosis which is the rule in the exudative form. The latter are regularly the more severe, and are usually found conjointly with infective diseases springing from other organs. The exudative inflammations much more commonly than the catarrhal lead to ulceration, and the ulceration may affect an extent of surface and reach a depth such as is never seen in the catarrhal forms.

The catarrhal inflammations include all those forms in which there is secreted a pathological, pus-containing mucoid fluid, and in which the inflammatory tissue changes (small-celled infiltration and proliferation) are confined to the superficial layer of the mucous membrane (the papillary bodies and their neighborhood, with the glands and follicles). Thus not only do the simple and virulent catarrhs in sensu strictori, but also the forms described as vaginitis glandularis, follicularis, miliaris, and papillaris, belong here.

Remarks.—In several recent treatises upon vaginal inflammations there is no mention made of catarrh, but only of the changes of vaginitis. (Ruge, Schroeder.) Much stress is laid upon the similarity in structure of the vaginal mucous membrane and the integument; it being claimed that from its want of glandular structures, its papillary surface, and its layers of epithelium, it resembles the skin much more than the mucous membranes. Bumm has lately reached the same conclusion, as have Eppinger and Fritsch. I hold that in spite of this analogy, we cannot clinically dispense with the idea of catarrh. It marks, as Virchow in another connection has again reminded us,[2] as its etymology (*καταρέω*) shows, the chief symptom, the flow, and enables us to group together the various forms of inflammation known as vaginal leucorrhœa, blenorrhœa, and pyorrhœa.

Pathological Anatomy.—While most authorities agree in their description of the anatomy of the catarrhal changes in the vagina as regards their macroscopic relations, and the clinical pictures correspond, there are but few and those varying reports as to the microscopic findings. We will refer at length to C. Ruge's important work, which is the first detailed anatomical investigation of vaginal inflammation.

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[1] Lehrb., 3d ed., vol. 3, p. 516.

[2] Berl. Klin. Wochenschr., 1883, No. 8.

Ruge divides vaginal inflammation into three forms:

1. Kolpitis granularis, which he takes as the type of vaginal inflammation; 2, simple kolpitis; and, 3, the kolpitis of old women. The first two vary as they occur as acute or as chronic processes. Ruge thus describes the development of the changes of kolpitis granularis

In consequence of the irritant which causes the inflammation, the entire epithelial layer is thickened, the increase being especially marked in the deeper layers. The proliferating layer, which in carmine stained sections colors more deeply than does the older tissue, may equal half the entire thickness of the stratum, and more. The papillæ are enlarged, the broader and higher ones often reaching up almost to the surface. In the epithelium there form pretty distinctly limited groups of small-celled elements, which wedge themselves in between the straight ascending vessels. This gives the tissue an adenoid appearance. Over these inflammatory infiltrations of the sub-papillary tissue, the epithelium is thinned out. Two processes can be noted in the papillæ:

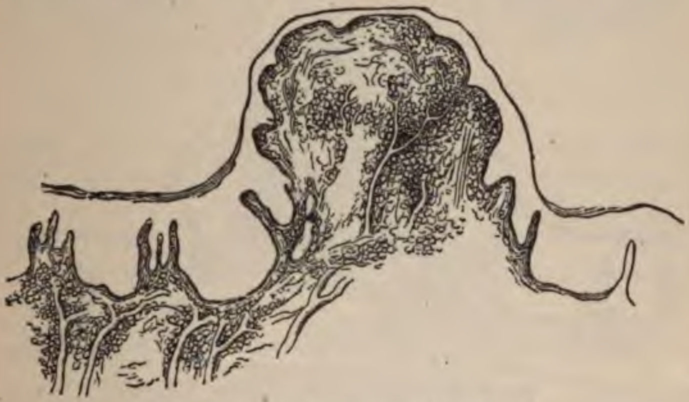

FIG. 27.—KOLPITIS GRANULARIS. (After *Ruge.*)

1. At one place the papillæ are larger and broader, and approach nearer the surface, and the epithelial processes which originally separated them become thinner. The papillæ themselves become thicker, but less prominent; finally, the papillæ coalesce, and the granulum consists only of a thin epithelial coating with inflammatory and infiltrated tissue lying below it.

2. As the tissue stretches the papillæ become larger and broader; the epithelial processes do not disappear; but they become thin and look like arcades supporting the epithelial layer. The epithelium over the granu-

lum is changed also. The larger epithelial cells become smaller, the thin epithelial covering over the granula looks like granulation tissue, and can hardly be distinguished from the structures lying beneath it. The vessels of the subjacent tissues are turgid with blood, and are increased in number. The appearance of follicle formation is deceptive; kolpitis granularis is not k. follicularis, nor k. papillaris. There is simply a sub-papillary, or sub-epidermoidal inflammation, accompanied by change in the epithelium and the papillæ.

A similar state of things prevails in the chronic form of kolpitis granularis, in a case which occurred from the long-continued wearing of a pessary. There were the same alterations, but the epithelium over the granular layer was less changed and thinned, and the tissue below it contained comparatively few nuclei. The thickened stratum of epithelium between the projections was pigmented, and of a sepia color in its lower strata.

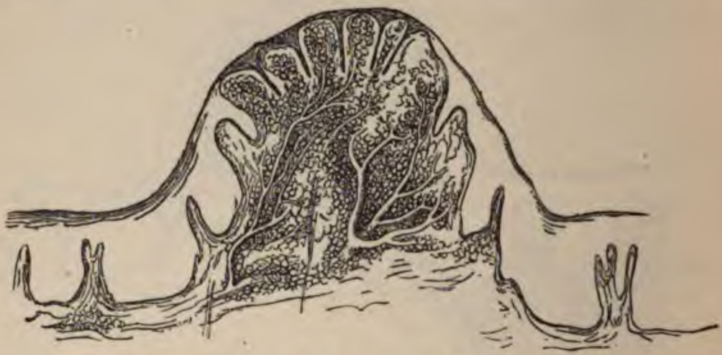

FIG. 28.—KOLPITIS GRANULARIS. (After *Ruge.*)

During the healing process the changes occur in the reverse order. As the swelling of the sub-epithelial tissue and the inflammatory infiltration disappear, the epithelial processes grow larger and broader, until papillæ and processes attain their original size.

In simple kolpitis the surface of the layer of pavement epithelium is smooth, but it is irregularly thick in various places. Where it is thinner the papillæ are enlarged, and the tissue beneath it shows a small-celled infiltration. The proliferation is confined to the epithelial layer, and thus kolpitis granularis is only distinguished from kolpitis simplex by the extent of the process.

In the chronic form the proliferation is small in amount, and there is pigmentation of the lowest layers. Here again there is no question of follicular or papillary kolpitis, nor of erosions, ulcerations, etc.

In the vaginal inflammation of old women there are seen larger or smaller confluent spots, which often project above the surface. There occur many transitional forms, from simple ecchymoses to flat elevations, which often contain a central softened, eroded, or ulcerated defect. The color of the spots is never so vivid as in kolpitis granularis; there are often adhesions of the vaginal walls, which, however, are easily broken through with the finger. The entire epithelial layer is thinned out. The spots correspond to circumscribed and often extensive and deep cellular infiltrations, which appear to lie directly on the surface. There is no trace of epithelium. Leaving out the changes incidental to old age, this corresponds in general to the anatomy of kolpitis granularis, save as to the great tendency to adhesion, and even to obliteration of the vagina.

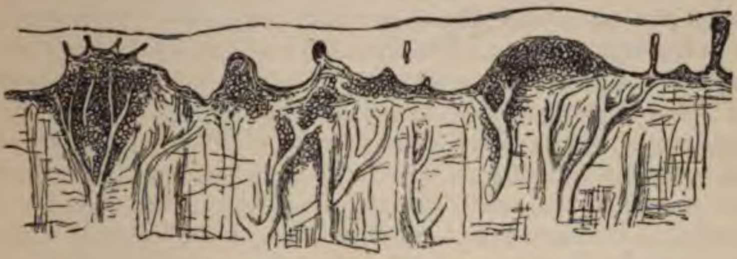

FIG. 29.—KOLPITIS SIMPLEX. (After *Ruge*.)

Eppinger has also made a series of careful investigations into the pathological anatomy of vaginal affections, and describes as kolpitis miliaris and vesiculosa forms which belong here.

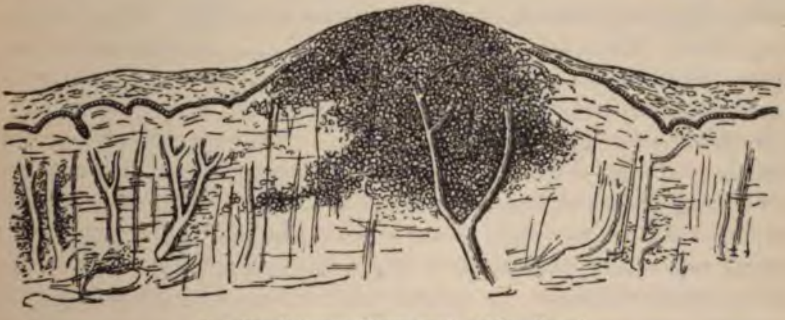

FIG. 30.—KOLPITIS VETULARUM. (After *Ruge*.)

Both are characterized by the occurrence of multiple, round, sharply limited exudation masses, which in certain stages of retrogression become ulcers, and appear as grayish spots to the naked eye.[1] The difference consists in that in kolpitis miliaris the exudate is cellular and partly interstitial; while in kolpitis vesiculosa it is serous, and collects between the epithelium and the sub-epithelial tissue to form a vesicle.[1] In both forms Eppinger noticed vertical and strongly injected vessels at the base of the inflammation, which were surrounded by a large number of proliferated cells. Eppinger did not observe that the papillæ participated much in the inflammatory changes; but for the rest his description coincides in all essentials with that of Ruge.

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[1] Zeitschrift f. Heilkunde, vol. 3, p. 177.

We may here mention the connection which Eppinger has proven between the sub-epithelial inflammatory infiltration and the pigmented gray spots in the vaginal mucous membrane. These latter were first described by Haller,[2] and have since been repeatedly supposed to be glandular structures.[3] But they are pathological in their origin, and begin as prominent, knot-like, superficial, cellular centres of infiltration (milia, granula), whose protruded epithelial covering often gives way, and forms the well-known central opening which has been so often supposed to be the duct of the gland; the surrounding pigmentary layer being supposed to depend upon circulatory disturbances. The conception of the Hallerian spots as sub-epithelial round-celled infiltrations is one which approaches the idea of the granula being a lymphatic follicle-like body, and the process a follicular vaginitis. This is important for our understanding of other conditions, such as the formation of gas cysts.

Etiology of Catarrhal Inflammation. As Klebs correctly claims, we must first learn to distinguish the physiological changes which the vaginal mucous membrane undergoes in menstruation and gestation, and in the puerperal period, from those which are due to catarrh. They are apparently alike. We must do the same with simple hypersecretion, occurring either from mechanical disturbances of circulation (stasis) or from general disturbances of nutrition, (chronic anæmia, chlorosis, etc.)

In the first set the clinical symptoms are not always sufficient for differentiation; and we must then decide from the connection between them and certain phases of the physiological function. Simple hypersecretion has only a few characters in common with catarrhal inflammation of the vaginal canal, such as increase of secretion, swelling of the mucous membrane, and blood stasis. So long as there is no qualitative changes in the secretion, and none of the alterations in the surface of the mucous membrane, which are characteristic of inflammation, have occurred, we must divide the two. But both the physiological changes and the hyper-secretion predispose to catarrh, since they seem to lead to diminish resisting power of the mucous membrane to irritants.

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[1] We cannot follow Eppinger in his differentiation of his kolpitis miliaris from the vesiculosa, and of both from the granulosa and vesicularis of the authors, since he bases it only upon some differences of detail in the histological findings. There exists a clinical necessity for a single conception of these forms, which should be united. We can thus obtain a basis which will enable us to understand the connection between the various phenomena which mark inflammation of the vaginal mucous membrane.

[2] Elem. phys. corp. hum., Tome vi. lib. 28, p. 26.

[3] Comp. Mandt. Anatomy of the female vagina (Zeitschrift f. rat. Med., vol. 7, part 1, p. 12).

Bumm's observation is of interest in this connection. He found that the puerperium caused an extremely abundant proliferation of gonococci, even in cases where the phenomena of gonorrhœa had sunk quite into the background. Bumm also ascertained the astonishing fact, that gonorrhœa practically never occurs primarily in the vagina, but usually spreads thence from the cervix, or more rarely from the urethra. He claims that the stratified pavement epithelium forms so good a protecting tissue that the gonococci cannot affect an entrance unless changes which render the more delicate layers accessible, have first occurred. On the other hand the mucous membranes covered with cylindrical epithelium, such as that of the cervix, are not so resistant.

It may be said in general of catarrhal inflammations of the vagina, that they are all caused by irritants which either come from without, or from neighboring organs. Such are mechanical irritants (injuries, foreign bodies), thermic irritants (burns, cold), chemical irritants (cauterization), and infectious irritants (gonorrhœal contagion).

By one or other of these irritants, in the last case by the passage of the pathogenic coccus into the sub-epithelial tissue at points of less resistance, reactive circulatory disturbances with increased secretion and abundant leucocytic emigration are set up. The effect is in all cases at first one and the same. The circulatory disturbances, however, soon subside, unless the source of irritation continues active.

This does seem to occur as a rule because decomposition processes go on at the primarily injured spot or in the secretions. We do not know the exact nature of the irritants which are thus produced; but we think that those of an infectious nature take the greater part in the process, penetrating into the tissue of the mucous membrane in various places, and keeping up circulatory disturbances by their presence and proliferation. This is proven by the fact that when decomposition processes are prevented by disinfection and the removal of the stagnating secretion, the effects of moderately severe traumata soon pass away, foreign bodies become healed in, or, as we see with pessaries, cause no catarrh; and cauterization with ferrum candens, the most violent thermic irritant, only causes an eschar and a very temporary swelling of the neighboring tissues, just as does a localized chemical cauterization. On the other hand, vaginitis catarrhalis occurs with certainty in all these cases where the neglect of antiseptic precautions leads to the decomposition of injured portions of tissue and of the stagnating secretions.

And the various decomposable foreign bodies which reach the vagina from the uterus, as well as stagnating vaginal secretions, blood-clots, etc., all lead to vaginitis, since contact with the external air offers specially favorable conditions for the reception and proliferation of the micro-organisms concerned in decomposition. Hence the frequent connection between catarrhs and menstruation and the puerperium.

As to the point of origin of the inflammatory process, the vaginal mucous membrane may be primarily affected, or it may originate from neighboring organs or tissues. The function of the vagina, as the organ of conception, gives rise to many occasions for the action of inflammatory irritants; while its communication with the open vulva, even apart from the chances of sexual intercourse, exposes it to the influence of external irritants, which it is especially prone to react against when circulatory disturbances (stasis, status menstrualis or puerperalis, descensus) are present. Gaping of the introitus is of importance. Primary ulceration, and disintegrating vaginal new growths, may also form the starting-points of catarrh, as may finally the various therapeutic measures which expose the vaginal mucous membrane to irritation.

The influence of neighboring organs is of much importance for the etiology of catarrhal vaginitis. From the uterus especially may come the cause of the catarrh process. Decomposing or infectious secretions may flow out of it (in endometritis, carcinoma, and cervical gonorrhœa), as may blood, lochial and menstrual discharges. Schultze has correctly claimed that the decomposition of the stagnating scanty menstrual blood, mixed with vaginal mucus, which occurs behind the narrow hymenal ring in chlorotic girls, is not infrequently the cause of vaginal catarrh. Then again polypoid tumors originating from the uterus may lie partially in the vagina, and cause retention of secretion; or the uterine tumor may disintegrate superficially, and lead thus to decomposition of the secretions. Finally, inflammatory processes which were primary in the cervical canal or the portio vag. may spread to the vaginal mucosa.

In contradistinction to the last-mentioned descending catarrhs, there are others which ascend from the primarily affected vulva. The vulvo-vaginitis of children, with cases of gonorrhœa of vestibule and urethra, and those due to labial exanthemata, belong here.

In the rectum also, and in the bladder, may the conditions causing vaginitis originate. The rectal contents may reach the vagina through fistulæ and perineal ruptures. And without any solution of continuity, oxyurides may reach the vagina by traversing perineum and labia, and infiltrations of the septum recto-vaginale may set up inflammatory changes in the vaginal mucous membrane. The same is true of the bladder, though the passage of undecomposed urine through the vagina is far less irritating than the passage of rectal contents. Fistulous communications of the vagina with abscesses of the pelvic connective tissue, with extra-uterine fœtal sacs, with incised or punctured pelvic cysts, lead the more regularly to catarrhal vaginitis the more putrid the secretion and the less care is bestowed upon its removal and upon vaginal disinfection.

Clinical Features.—The condition of the mucous membrane which is affected with the catarrh has much influence upon this. The changes incidental to advanced life, to the hyperplasia of gravidity, to pathological processes which have become stationary, may modify the picture greatly. Apart from these latter, the usual appearances in the adult non-pregnant woman are as follows:

In acute catarrh congestive swelling prevails. The diffuse redness, relaxation, and tumefaction may affect the entire vagina, or may be limited to its upper or lower segments. The rugosities are less prominent, and the redness is most intense at their summits. With the naked eye, or more plainly with a magnifying glass,[1] we can see that the papillæ are somewhat swollen and injected, causing a fine roughness and a dark punctation of the vividly red surface of the mucous membrane. Here and there minute extravasations are visible, and sometimes eroded strips or spots. The mucosa bleeds easily when touched, and is immediately recovered with secretion after its removal. The vagina often feels warmer than usual, and in acute catarrh the introitus is always sensitive. This tenderness is more marked when the catarrh has spread to parts in the neighborhood of the introitus; in which cases the swelling of the columna rugarum is always more marked, and the hymen participates in the swelling and redness. There are then frequently eroded spots on that membrane. If the catarrh affects especially the upper portion of the vaginal tube, the vaginal covering of the portio will participate in the process. Upon its surface the papillæ will appear as injected protruberances, and we will frequently see erosions of the os uteri and neighboring structures.

While at the very beginning the secretion is scanty and serous, it is usually abundant, muco-purulent, and yellow in color by the time we examine the patient. Its reaction is generally faintly acid;[2] it contains desquamated epithelium cells, numerous leucocytes, cell detritus and various cocci and bacteria. These latter, which are found in the healthy vagina also, become important when pathogenic forms prevail. The gonococcus of Neisser has been the most carefully studied of these organisms, and the proof of its existence in any given case furnishes perhaps our best criterion as to the existence of gonorrhœa; since the clinical pictures presented by catarrhs of various origin are entirely alike, and the other criteria, such as the involvement of the urethra, are not always present.[1] Naturally we must be cautious and not take cervical for vaginal secretion. The cervix should be closed with a small tampon, and the vagina first cleansed of the mixed secretion, before collecting the vaginal fluid for examination.

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[1] I have used for several years a 6 inch glass, constructed on the principle of the Brücke loup, for the exact examination of the vagina and portio through the speculum.

[2] Martineau (Ann. d. Gyn., 1885, Tome xxiv. p. 51), claims that Neisser's gonococcus can only flourish in a sour fluid, and believes that primary gonorrhœal affection of the cervix is extremely rare. In the Hôpital Lourcine he saw it only 10 times in 4,000 cases.

In chronic catarrh there are certain symptoms which show the long continuance of the affection, and especially the following:

1. The swelling and relaxation for a long period of time has caused an increase in the mass of the mucous membrane, in consequence of which the relaxed wall is folded upon itself, with furrows containing the pathological secretion between the folds.

2. The mucosa is no longer evenly injected. Upon the grayish (pigmented) surface there appear circumscribed, red, vascular areas and spots, corresponding to the apices of the rugosities; and here and there we will see eroded places.

3. The papillæ are no longer so diffusely swollen, though to a greater degree than in acute catarrh. But it is especially in chronic gonorrhœal catarrh that the hypertrophy of the papillæ becomes very marked, even in non-pregnant women. It is seen in three forms. There may be papillary hypertrophy over large areas, giving the mucous membrane an even sandy appearance of a pale grayish color; or the papillæ may grow in circumscribed spots to form papillomata and pointed condylomata; or finally there may be a moderate and general papillary hypertrophy, giving rise to club-shaped protrusions, each one of which corresponds to a group of hypertrophic and swollen papillæ. These papillary granulæ cannot be microscopically distinguished from the granulæ which we will describe further on, in which the papillæ are not involved. Only the extent and the evidences of other changes enable us to decide as to the latter form.

The secretion in chronic vaginal catarrh may vary very much. Sometimes it is abundant, cheesy, or purulent; at other times it is grayish white and mucoid. Even in the latter case it may contain many gonococci. The amount of epithelium present in the fluid is usually very great; there are leucocytes in varying quantity; in fact acute and chronic catarrh contain the same formed elements, their amount and relative proportion varying with the consistency and color of the secretion. In the cheesy yellow secretion of chronic catarrh, we not infrequently find the trichomonas vaginalis which Donné has described, and Kölliker and Scanzoni have investigated; but we do not know that the occurrence of this infusorium bears any relation to the composition of the secretion.

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[1] Compare esp. E. Bumm, l. c. The figure of 8 or dumb-bell figure of the gonococcus of Neisser, which Bumm compares to two coffee-beans with their flat sides in opposition, is not of itself sufficiently characteristic; a number of similar diplococci are present in the secretion, some of which are not pathogenic at all, and others of which are indeed pathogenic, but are both in their relations and their actions upon the mucous membrane entirely different from the gonococcus. We must be able to demonstrate that they are mainly located upon the pus cells, into the protoplasm of which they apparently penetrate; and there must also be the heaps of cocci upon which Neisser has laid so much stress. Bumm recommends the following as a convenient method of examining the secretion for gonococci; it is the method employed at the Wurtzburg Clinic, and takes but 2 to 3 minutes. The secretion is spread out thinly upon an object-glass with the blade of a knife, dried in the flame, exposed for from a half to one minute to a concentrated watery solution of fuchsin, washed, again dried in the flame, and examined at once, without cover-glass, in oil, with a homogeneous immersion lens.

Follicular Vaginitis.—In exceptional cases of chronic catarrh we find as the most striking change of the mucous membrane the development of those round granula or noduli, whose origin is still a matter of dispute. Some authorities consider them to be lymphatic follicles (Birch-Hirschfeld, Winckel); others, mucous glands (Thomas, Heitzmann); others again, papillary structures (Rokitansky, Bois de Loury, Costilhes, Kiwisch, Ruge); and still others, circumscribed sub-epithelial inflammatory foci (Eppinger, Ruge). Clinically we must separate this form from the catarrhs accompanied by the usual papillary changes. Deville first characterized it as vaginite granuleuse; but it has been known as vaginitis granularis, follicularis, miliaris, psorélytrie, etc.

For the affection shows a number of peculiar and characteristic symptoms.

a. It occurs most frequently during gravidity, and often disappears spontaneously during the puerperium, even during pregnancy if antisepsis is thoroughly carried out. It has only been observed in non-pregnant women in extremely rare cases, so far as I know, and then solely in persons of middle or advanced life.

b. Its usual seat is at the fornix vaginæ and the adjacent mucous membrane, especially of the posterior wall; only exceptionally does it affect the greater part of the vagina.

c. The granule or noduli itself may be distinguished by the touch from the ordinary papillary hypertrophies. Whilst the latter feel hard and rough, the former are smooth, round, soft, lentil-shaped prominences. Where closely aggregated in the fornix, the mucous membrane may feel as if it were filled with closely-packed small varices. Through the speculum they appear as round, smooth, isolated or grouped, broad-based protuberances, of a bright reddish or paler grayish color, which show very distinctly upon the swollen and vascular membrane. Occasionally they are surrounded by a vividly injected, red, seam-like border, and show here and there a central groove or opening. Whilst the other catarrhal changes of the mucous membrane are never absent, the complication of extensive papillary hypertrophy may often be absent.

d. We cannot deny that this affection stands in relationship to the development of vaginal gas-cysts. We regularly find in kolpohyperplasia-cystica transition forms between granulis with the central depression and the gas-containing prominences. The common location at the fornix, and the common chronically inflamed base, also point in the same direction.

e. Finally, as Eppinger has proved, where disintegration of the circumscribed cellular infiltrate which forms the granula or milia occurs, a central opening appears; and with the retrogressive changes at the inflamed spot there begins the floccular pigmentation of the mucous membrane so frequently seen in elderly individuals, though sometimes observed in young persons. We must therefore regard the rounder, sharply limited and grouped spots of pigmentary deposit, even when no infiltration or loss of substance is discoverable, as the remains left by this form of vaginitis.

f. Though papillary hypertrophy is chiefly caused by virulent catarrh, we cannot prove any causal relationship between the granular form and gonorrhœa.

Heitzmann,[1] who gives a good specular picture of a follicular vaginitis, recently claims that he has observed it not only in pregnant women, but also in young girls suffering from virulent and non-virulent catarrhs. But he refers this form to the participation of glands in the inflammation, which are not regularly found there; and he gives a drawing of a microscopical preparation, which does show marked and partly dilated gland-like depressions.[2]

His idea is that the central cavities of the granulis in vaginitis follicularis are nothing more than the dilated excretory ducts of the swollen and inflamed glands. Only after the glands have been destroyed by suppuration are their places taken by the lymph-follicle-like arrangements which Birch-Hirschfeld mentions.

Although the concensus of opinion of other investigators is that the relation claimed by Heitzmann between true vaginal glands and the nodules with disintegrating centres of follicular vaginitis is not proven, his drawings show that he has really seen ectatic glandular structures in catarrhal vaginitis, and that in cases where glands are present, true retention follicles may occur.

We will accordingly entirely discard the term granular vaginitis, since both the papillary and the above-mentioned form are included under it; and we will call the latter follicular vaginitis, for the analogy between the circumscribed small-celled accumulations in the superficial layers of the mucosa, and lymphatic follicles, has been dwelt upon by several observers, and is supported most recently by H. Chiari's observations.[3]

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[1] Specular pictures of the healthy and diseased vaginal portion and vagina, Wien, 1883 (W. Braumüller), p. 165, Taf. xiii. fig. 2.)

[2] L. c., p. 166.

[3] Zeitschrift f. Heilkunde, Prag. 1885, vol. 6, p. 99.

I intend to consider here two changes of the catarrhally inflamed mucous membrane, for I believe them to be only modifications of follicular vaginitis; I refer to the formation of vesicles containing serum and gas.

Vesicular Vaginitis.—Eppinger first investigated this form of the malady, which he called vaginitis vesiculosa or herpetiformis. It is formed by the epithelium of the infiltrated area being raised over a vesicle by the serous exudation. If the vesicles rupture, they have superficial, circular, sharp-edged erosions behind, which when large much resemble ruptured pemphigus blebs. Kleinwächter,[1] however, is the only one who has observed these erosions in connection with pemphigus, his patient being thirty years old, and having had pemphigus of the lower limbs for three years. Apart from the vesiculation, all the other appearances, as well as the termination in the Hallerian pigment spots, are in exact accordance with the variety called miliaris by Eppinger, here termed follicularis; and we can only regard it as a modification of that form.

Emphysematous Vaginitis.—This second modification appears as multiple cysts of the vaginal mucous membrane with gaseous contents. To F. Winckel belongs the credit of having first minutely investigated it in the cases of some pregnant women. He called it kolpohyperplasia cystica.[2] In his communication he reviewed the observations of Eppinger,[3] Schroder,[4] myself,[5] Näcke,[6] Schmolling,[7] Chenevière,[8] Zweifel,[9] and Ruge.[10] Since that time there have appeared researches upon the subject by Klauser and Welponer,[11] Eppinger,[12] Lebedeff,[13] Zweifel,[14] Hückel[15] and H. Chiari.[16] It is true that occasional and very excellent observations upon such cases had been made by Ritgen and C. Braun before Winckel; but the latter was the first to thoroughly investigate the subject.

In the vaginæ of pregnant women, exceptionally in those of puerperal and non-pregnant women, there are found hemispherical prominences with soft smooth surfaces, in some few cases of which an emphysematous crackling can be recognized even with the finger. They usually occur in the upper third of the vagina, and may affect the portio vag. Through the speculum they appear as grayish translucent vesicles of from corn grain to grape size, occurring in irregular and often crowded groups.

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[1] Prager Med. Wochenschrift, 1878, No. 6.
[2] Archf. f. Gyn., 1871, vol. 2, p. 383.
[3] Prager Med. Vierteljahrsschrift, vol. 120, p. 32.
[4] Deutsches Archiv. f. Klin. Med., vol. 13, p. 538.
[5] Corr.-Bl. f. Schweizer Aerzte, 1875, vol. 5, p. 430.
[6] Archiv. f. Gyn., 1876, vol. 9, p. 461.
[7] Dissert., Berlin, 1875.
[8] Archiv. f. Gyn., 1877, vol. 11, p. 351.
[9] *Ibid.*, 1877, vol. 12, p. 39.
[10] Zeitschrift f. Geb. u. Gyn., 1878, vol. 2, p. 29.
[11] Centralblatt f. Gyn., 1879, No. 14.
[12] Zeitschrift f. Heilk., 1880, vol. 1, p. 369.
[13] Archiv. f. Gyn., 1881, vol. 18, p. 132.
[14] *Ibid.*, vol. 18, p. 359.
[15] Virchow's Archiv., 1883, vol. 93, p. 204.
[16] Zeitschrift f. Heilk., 1885, vol. 6, p. 81.

Many vesicles appear sunken, or have a central depression. They all spring from a swollen, bright-red surface; when pricked they collapse without any fluid exuding, and we can often hear the noise made by the escaping gas. At the utmost they may exceptionally contain a few drops of serous fluid.

There is usually also an abundant dirty-yellow mucoid discharge. A very correct picture of the portio vag. and the neighboring tissues in this condition accompanies Chenevière's communication.

Microscopic examination of the dead and living tissues has as yet given us no certain information as to the condition. Winckel, Zenker (in Schröder's case) and Hückel found the inner wall of the cyst distinctly lined with epithelium. Lebedeff found it absent in part. Klebs, Eppinger, Ruge, and Chiari could never demonstrate it. And the latter observers unite in asserting that they found a number of communicating cavities in each round cyst, which, being entirely devoid of epithelium, could only correspond to clefts in the tissues. Klebs believed that they were caused by micro-organisms in the lymphatic spaces. Eppinger sums up his six cases thus: "Emphysema of the vagina is distinguished by the appearance of very numerous grouped air vesicles in the lymphatic channels of the interstitial connective tissue, especially along the vessels; and its occurrence is greatly favored by œdematous loosening of the interstitial connective tissue in consequence of venous stasis." In all his cases there were circulatory disturbances; but vaginal catarrh or other inflammation Eppinger does not consider necessary for the occurrence of emphysema. Lebedeff also considers passive hyperæmia to be the efficient cause, but claims that the air cysts are due to extravasations in the interstitial connective tissue. The latest monograph upon the subject is that of Chiari. Celloidin, embedding of alcoholic preparations, and staining with alum-cochineal enabled Chiari to reach some new and remarkable conclusions. He used two new cases and five of Eppinger's which had been preserved in the pathologico-anatomical museum at Prague. In both of his own and in the three best preserved of the other specimens he found "that the gas-cysts are always without a proper wall; and that their internal surfaces are characteristically lined in part by flattened or rounded giant cells. In every case these giant cells were also found in the lymphatic capillaries, being evidently derived from their epithelium; and in every case lymph-follicle-like heaps of round cells and lymph capillaries filled with lymph cells, could be demonstrated in the mucosa vaginæ." In two cases of Chiari's and two of Eppinger's the round erosions present were found to be due to the opening of gas cysts. Very commonly, as Eppinger has noted, the cysts follow the blood-vessels in their course. Nor was venous stasis absent in Chiari's cases; both patients had heart lesions. Chiari concludes that the condition is connected with a pathological change of the lymphatic apparatus; and that the gas-cysts develop in preformed pathological spaces in the lymphatic system, which are filled with a mass of epithelial cells, part of which have been changed to giant cells. Chiari found by careful examination *post mortem* of the vaginal mucous membrane of many subjects, that lymph-follicle-like structures are fairly frequently found both in old and young individuals. He could generally recognize them as grayish points with the naked eye, and usually found them in the upper part of the vagina, especially along the posterior wall. They appeared almost always to be combined with a catarrh, and always gave him the impression of a new growth. The small punctate central openings, into several of which a bristle could be passed, were the orifices of ectatic lymphatic spaces. These structures were histologically exactly like the gas-cysts, and were traversed and surrounded by capillary passages filled with lymphoid cells. In a small percentage of these cases Chiari found giant cells in the lymphatic capillaries.

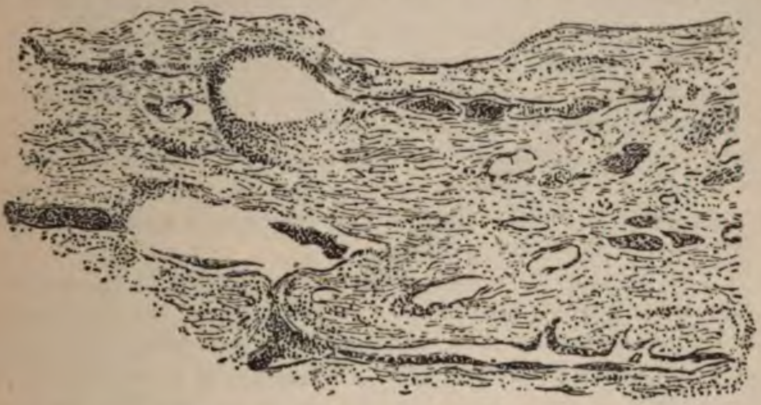

FIG. 31.—SMALLEST GAS CYSTS, AND FISSURES CONTAINING LYMPHOID CELLS. Giant cells and proliferated epithelium. (After *Chiari*.)

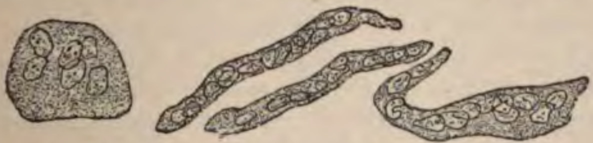

FIG. 32.—GIANT CELLS, FLATTENED IN PART. (After *Chiari*.)

These investigations of Chiari show the connection between the lymph-follicle-like round cell accumulation and the gas-cysts, and the relations of both of them to dilated lymphatic vessels.

Hence it is very probable that the not papillary but follicular nodules seen in catarrhal vaginal inflammation really are connected with the lymphatic follicles; and that the formation of gas is simply a change which occurs under certain circumstances in the lymph follicles and the neighboring canals. Hence the extent of gas accumulation in the deeper layers of the vaginal walls, though the original follicular change affected only the mucosa, and chiefly its more superficial layer

Chiari is inclined to believe that the development of gas and of the giant cells may have a common cause in some bacterial activity. It is true that we only have a somewhat far-fetched experimental proof of this connection. L. A. Nägeli[1] found, when experimenting upon the formation of extravasations in doves, that out of seventeen cases where infection occurred with the wound, eleven had micrococci in the extravasation and giant cells upon the outer surface of the clot. The giant cells were absent in twenty out of twenty-one cases in which the process was carried on with perfect antisepsis.

It is true that cocci have not yet been demonstrated in the gas-cysts, and Lebedeff is the only one who has as yet brought the extravasation formation into connection with the formation of gas-cysts. Nevertheless Nägeli's observation deserves further investigation in its relation to gas-cysts, especially as venous stasis has been proven by Lebedeff, Chiari, and Eppinger to be the usual predisposing moment for the condition.

Nor has the question as to the origin of the gas in the cysts found a decisive answer. Schröder first demonstrated its nature by puncturing the cysts under water; but its composition has not been ascertained. Eppinger concludes from a case which Lerch examined, that it is atmospheric air; and this seems to be confirmed by a case of Klauser and Welponer. Zweifel believes it to be trimethylamin, and finds confirmatory evidence in the fact that Hilger has lately proved that trimethylamin is present in the vaginal secretions of healthy pregnant women. At all events it is very probable that it is not simply atmospheric air; and Klebs is I think right when he says that germs present in the vaginal secretions get into the affected cavities, and give rise to the development of gas.

The constant presence of swelling and hypersecretion, as also the microscopic appearances which most observers have found, entitle us to place the affection among the chronic inflammatory ones of the vagina, and have led to the designations kolpohyperplasia cystica (Winckel), kolpitis vesiculosa (Schmolling), or k. emphysematosa (Ruge, Zweifel). It certainly occurs less frequently in non-pregnant women. I have seen it over twenty times developed to a varying degree in gravid women, and only twice in others. I can sustain Winckel's assertion that kolpohyperplasia cystica causes no serious symptoms, and has in most cases disappeared by the ninth or tenth day of the puerperium.

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[1] On the influence of bacteria upon the development of giant-cells with lateral nuclei. (From the Path. Inst. of Langhans in Bern.) Arch. f. Exper. Pathol., vol. 19, p. 101.

It is evident that since most of the cysts are superficially located in the sub-epithelial connective tissue, their disappearance is due to the stretching and compression of the vaginal wall during labor, and the abundant secretion and desquamation during childbed. Air-cysts which are deeper seated persist much longer. Schröder saw them well-marked upon the tenth day; and in a case described by Chenevière and which we observed, the cysts were most developed on the thirtieth day *post partum*, and some were still present even upon the forty-sixth day.

Special treatment would hardly be required did not the affection always occur in connection with a catarrhal vaginal flow. Disinfecting injections are indicated; carbolic acid or corrosive sublimate may be used, or, as Zweifel recommends, water acidified with hydrochloric acid.

Gravidity exercises an influence upon the catarrhally diseased mucous membrane on account of the increased vascularization and hyperplastic tissue increase which occurs in the vagina of pregnant women; and also by the venous stasis which is so early caused by phlebectasus in multiparæ. Hence the swelling, relaxation, and diffuse injection of the mucous membrane, as well as the papillary hypertrophy, reach a high grade in the vaginal catarrh of gravid women. It occurs in them more often than in non-pregnant women without any gonorrhœa being present. As we have already said, gravidity offers the most favorable conditions for the development of the nodular hyperplasias. And for the same reasons the secretion is more abundant, and the whole course of the disease a more obstinate one.

A certain influence is also exerted by age. The mucous membrane at the time of senile involution, possesses anatomical peculiarities so marked as to give a different picture when attacked by catarrh than does the mucous membrane of the adult vagina. Hence there occur changes rather in spots than diffuse; and hence also the tendency of circumscribed sub-epithelial extravasations to undergo ulcerative degeneration with consecutive adhesion, which Ruge has so well described. Sharply circumscribed purulent and easily bleeding erosions of the vaginal mucous membrane often occur in senile vaginitis; but papillary swellings are not so common. On account of the frequency of adhesions, especially in the atrophied fornix, Hildebrandt[1] has been led to erect this into a separate form, which he calls vaginitis chronica adhesiva. They can usually be easily broken down with the finger; but where they cannot some caution is necessary, since from the friability of the atrophic mucosa false passages into the peri-vaginal connective tissue may readily be made by attempts at division.

Much more rarely the infantile vaginal mucous membrane is said to be disposed to form adhesions when attacked by vaginitis. Such cases have been described by J. Y. Simpson.[1] They are said to cause close of the introitus by the union of excoriated surfaces without suppuration. Simpson remarks that want of cleanliness cannot be the cause of these inflammations, since he has seen it in two children in spite of the most careful attention. It is difficult to prevent adhesion, which we must endeavor to do by means of pledgets soaked in oil or glycerine. Save for a little pain in urination, there are no symptoms. Inspection reveals the fact that the vaginal entrance is closed by a grayish, non-vascular membrane, which does not bleed when torn. Simpson considers the affection to be a special form of adhesive inflammation. I cannot decide from Simpson's short and indefinite description whether we are not dealing with retro-hymenal epithelial adhesions, and not with any inflammations at all. Or there might have been simple adhesion of the labia. For the former speaks the non-vascular membrane at the introitus, for the latter the treatment which Simpson recommends.

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[1] Monatschrift f. Geb., vol. 32, p. 128.

Subjective symptoms are never absent in acute catarrhs, and depend upon the cause and the seat of the affection. Most commonly there is a feeling of heat and burning in the pelvis with difficulty in urination. This latter may consist in difficulty in voiding water, but is more commonly seen, especially in catarrhs affecting the introitus, as a feeling of burning on micturition, even when no urethritis can be proven. Often the patient complains of troublesome itching around the genitals and of burning of the portions of skin which are bathed by the secretions. More rarely disturbances of the general health appear; there is anorexia, lassitude, nausea, or nervous excitation. Acute gonorrhœal catarrh, affecting the introitus, causes the most violent symptoms. We hardly ever see fever. In chronic cases we get very varied symptoms.

As a rule, complaints of illness, weakness, want of appetite, and nervousness predominate, which we can easily understand from the long-continued loss of fluid. But, as Schröder remarks, there are women who have no trouble at all. The local difficulties also are not so marked as in acute catarrhs, and are chiefly confined to burning and itching sensations about the genitals.

The prognosis of catarrhal inflammation, if left to itself, is not a good one. If treated, it is usually good, though relapses often occur. Acute catarrh has a great tendency to become chronic, since the causes which originate it, do not tend to subside of themselves. The continuance or recrudescence of the catarrh is favored by the unevenness of the surface of the mucous membrane, which lead to the retention of secretion in its furrows and in the crypts of the introitus; and also by the periodic fluxions of menstruation, and those of gravidity and the puerperal period. In children and virgins the hymenal ring hinders the outflow of secretions; and in old women there is the tendency to ulceration of the inflammatory focus. And although the catarrh does not cause any danger to life, it does depress the general health both by the albuminous waste, the changes in the vaginal mucosa itself, and the abnormal nervous excitation caused by extension of the process to neighboring organs. Besides, in its acute stages it prevents coitus, even if in general it does not influence the capability of conception. During childbirth it may easily cause infection of traumata; and the gonorrhœal form is always liable to cause infection in wounded surfaces or predisposed mucous membranes which come in contact with the secretion.

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[1] Sir J. Y. Simpson, Clinical Lectures, &c., ed. by A. R. Simpson, Edinburgh, 1872, p. 259.

The treatment of catarrhal inflammation of the vagina demands above all things the removal of its cause. Then we must reëstablish favorable conditions for the relief of the circulatory disturbances, thus limiting the secretion and promoting retrogression of the inflammatory changes. The local is therefore the most important part of the treatment, which may be helped by a suitable general treatment. The latter consists essentially of a suitable regimen dieteticum, rest, care of the bowels, etc.

Especially to be avoided are alcoholic and aromatic drinks. Sedatives are only indicated occasionally in very sensitive patients. Lukewarm, indifferent or slightly stimulating sitz and general baths do good by lessening the sensibility of the parts, preventing irritation of the skin of the external genitals, adhesion of the labia by dried-up secretion and other consequences of uncleanliness. Chronic cases do not require such strict general treatment, though a careful regimen is undoubtedly useful, and the use of alkaline and stimulating baths are of service in complicated cases. Even in the chronic form it is important to prevent exascerbations by a careful regulation of exercise, food, cleanliness (especially at the menstrual epoch), and the avoidance of coitus. The physiological complication of pregnancy requires the same care as does menstruation; while during the puerperal period the necessary regimen is in any case carried out.

If pathological complications influence the catarrh, they must be combatted at the same time. It may be necessary to treat uterine affections; and the case of any chlorotic or chronic anæmic condition which may be present is an essential condition for the success of the local treatment.

Sometimes the simplest methods suffice to control the catarrhal condition, in cases where we know the cause, as for instance, the removal of foreign bodies (frequently pessaries), or of stagnant secretion. Ordinarily, however, the treatment must be directed towards overcoming infection, that is nullifying the life and development of the bacteria which are in the secretion, and we must here disinfect without at the same time irritating. After neutralizing the infectious action on the mucous membrane, the after-treatment does not amount to much, since the inflammatory swelling, the circulatory disturbances and the abnormal secretion will disappear largely of themselves. Nevertheless we should not too strictly abstain from local treatment, particularly in chronic cases where there exist papillary excrescences, erosions, etc.

In order to disinfect properly it is necessary that:

1. The secretion be rendered harmless, and its stagnation prevented.
2. The entire superficies of the mucous membrane must be brought into contact with the disinfectant, and contact of diseased parts with one another must be prevented.
3. The disinfectant should be of the proper strength.

In order to wash away the secretion, it is preferable to use an irrigator holding at least two quarts, and which should be refilled two to three times in succession. The patient should be informed carefully how to use it. In order to avoid unpleasant sequelæ, which ordinarily follow on the injected fluid entering the uterus, attention must be paid to a number of rules, even as in case of uterine irrigations. The irrigator should not be hung too high (about three feet above the genitals will suffice); the patient should occupy such a position that the pressure in the pelvis does not become negative, that is to say, she should ordinarily assume the sitting or the half-sitting posture. The injection tube should not be inserted too deeply towards the cervix, and in order to bring the fluid in contact with every part of the canal, it should be moved from side to side, and forwards and backwards. The free outflow of the fluid should be assured, and where the introitus is narrow, this is done by lateral pressure with the injection tube. A simple tube with central opening, of glass or hard rubber, so that it may be readily cleansed, can be used.

The water should be lukewarm (24° to 26°) in order to avoid the irritating effect of heat, and the irrigation must, according to circumstances, be repeated twice to four times daily.

If it could be expected that simple cleansing by these irrigators would suffice, as they occasionally do in uncomplicated cases, then we might use water or some indifferent fluids, such as were formally used for the prevention of the irritant action of an acute catarrh. But recent investigations have clearly taught us that the irritant effects remain even after the use of disinfectants, although they control directly the most infectious causes of the inflammation. Injections of flax-seed infusions, of althæa, etc., are, therefore, no longer resorted to.

The mechanical effect of the irrigation will, however, be only partially obtained when it is administered in the way we have outlined, since thus the entire mucous membrane is not cleansed. If the injection is administered by the physician, there is greater chance of the aim being fulfilled, for the vaginal walls may be held apart by depressors or specula. This separation of the vaginal walls fulfills also the second condition, which is, that the mucous membrane, in its entirety, must be exposed to the action of the disinfectant. It is, therefore, essential after disinfection to insert an antiseptic, slightly absorbent tampon in the vagina, in order to keep the walls separated, and to smooth out the rugæ. We use for this purpose soft dry tampons which may be impregnated with one or another disinfectant. In case the vagina is not to be thoroughly tamponed, in which event the physician must himself attend to it, the patient should be taught to insert a tampon herself after each injection, and she can do this most readily by means of a simple tampon carrier, which I use very frequently, for I find that while oiled tampons may be inserted by the finger alone, dry tampons by soaking up the secretion in the introitus are apt to become painful as they are inserted.

An essential point for the carrying out of these manipulations, and also for the success of the local treatment, is that the introitus vaginæ be not too narrow. In children and in virgins treatment is rendered very difficult by this narrowness, since it leads to retention of secretion. In obstinate cases we must resort to dilatation or to discission of the hymen, even as in case of stenosis vaginæ it is necessary to overcome the condition before treating the catarrh.

When disinfecting agents are used they should be as dilute as possible, and yet be effective. The experiments in regard to the minimum amount of various agents which are of use in diminishing the signs of life in certain bacteria, give us approximate data as to what we should use in cases of known infection, such as sepsis, gonorrhœa. These results, however, are not purely applicable to practice in that the microbes are differently situated on the mucous membrane than in culture solutions, and so the work of the antiseptic must finally depend on the therapeutic results which it yields. The possibility that disinfection, aside from direct action on the infection-carriers, may act indirectly on them by changes in the tissue in which they lodge, is not, as Oppenheimer rightly remarks, excluded.

The following table recapitulates the results obtained by Oppenheimer in his experiments in regard to the action of agents on gonococci. The best agents proved to be sublimate and creosote. The former was effective in solutions of 1:20,000, and the latter in the strength of one drop in 20 cm. of water. The cocci were killed:

By alum acet.	in minimum	solutions of	5:100
" zinc sulph.	"	"	5:100
" copper "	"	'	5:100
" zinc chlorat.	"	"	4:100
" sesquichlor ferri	"	"	1:10
" argent nitr.	"	"	2:100

By hydrarg bi-chlor		in minimum	solutions of	1:20,000
" hydrarg nitrat.		"	"	1:10,000
" hydrarg sulph.		"	"	1:10,000
" potass permangan.		"	"	5:100
" aq. chlorat.		"	"	1:2
" aq. bromata	not diluted.	"	"	1:0
" aq. iodat.		"	"	1:0
" alcohol absolut.		"	"	1:0
" æther sulph.		"	"	1:0
" glycerin		"	"	1:0
" chloroform		"	"	1:0
" acid carbol.		"	"	4:100
" acid salicyl.		"	"	5:100
" thymol		"	"	5:100
" carbolized oil		"	"	10:100
" carbolized glycerin		"	"	5:100

Copaiva balsam and cubebs, although detected in the urine, acet. of lead, bismuth subnitrate, chloride of potass, chloride of calcium, resorcin, tannin, etc.,were worthless.

In regard to the strength of the disinfecting solution it is to be remembered that the first copious irrigation must be relatively concentrated, and it will depend on the stage and quality of the infectious inflammation as to whether it must be repeated in similar strength. Experience proves that in many instances, where we are not dealing with gonorrhœa, protracted irrigation with weak solutions accomplishes the aim by preventing the extension of the bacteria. In case of gonorrhœa, however, strong solutions must be used on account of the chronicity of the affection.

At the first irrigation we use sublimate solution of 1:1000 to 2000, or carbolic 5:100, and repeat in the strength of 1:5000 sublimate, ½ to 100 carbolic, in other instances using even weaker solutions. Only later do we use permanganate of potass, or astringents (copper, zinc, etc.).

Disinfectants may also be brushed over the vagina or poured through a speculum. A tubular speculum is inserted into the vagina, the vaginal walls being thus held apart, and they are bathed in the fluid. Here strong slightly caustic solutions are useful, such as nitrate of silver (2 per cent.), wood-vinegar (Schroeder), tincture of iodine, etc. The canal should be irrigated and wiped out before pouring in these agents. In case superficial sloughs are thus caused, iodoform should be insufflated after the excess of solution has run out.

We now pass to the use of agents in powder form and to the dry intravaginal packing. We have already spoken of the advisability of inserting a disinfecting tampon into the vagina in the intervals of the irrigations, in order to keep its wall apart and to disinfect any stagnant secretion. Sänger has especially advocated the dry disinfecting tamponade of the vagina in the surgical treatment of the genital canal, and he prefers iodoform gauze. He advocates this method even in case of inflammatory affections of the vagina, since it has the advantage of preventing decomposition of the secretions, and of sparing the patient the painful manipulation with the irrigator. I do not know whether Sänger or anyone else has ever methodically followed this plan in the treatment of catarrh of the vagina; I have never tried it, although I have satisfied myself of the value of iodoform packing in other cases. My experience with the dry and aseptic treatment of catarrhal disease of the vagina has as yet been entirely limited to tampons of absorbent cotton, formerly salicylated, but latterly largely sublimated, and occasionally iodoform cotton. Although by changing these tampons twice daily, good results were obtained, the iodoform alone could remain in the vagina one to three days without causing odor. Only very exceptionally, however, have I left them in so long, since at the end of one day the cotton becomes coated with mucus and it loses, in a measure, its absorbability. Since gauze is more absorbable than cotton I believe that Sänger's suggestion is worthy of trial, and on account of its antiseptic principle (something else than iodoform might be used) it differs from the old methods of application of astringents which were recommended by Scanzoni, Gautier, and latterly, again, by Gougenheim. Aside from iodoform, other antiseptics have been tested but little in the dry protracted tamponing of the vagina, and I can only cite H. Schmid's practice of filling the vagina with salicylic powder and letting it remain there one to four weeks. Schmid has not tested this method in case of vaginitis since it irritated the vagina. Dry salicyl powder has, however, been inserted into the vagina, during the puerperium, in particular, by Credé, Fehling, Gusserow, Fritsch, and others.

In case of catarrhal vaginitis the use of tampons covered with one or another ointment is favored by many. Hildebrandt advocates, in case of chronic catarrh, tampons covered with an ointment composed of five parts of alum and thirty parts of lard, and also the glycerin tampon; Terillon and Auvard inject directly a salve composed of vaseline, 150 parts, starch, 150 parts, tannin, 30 parts. Suppositories are also recommended, generally made from butyr-cacao mixed with equal parts of ung. emolliens to render them less brittle. Iodoform is used in capsules with a few drops of glycerin. Where salves and suppositories are not held *in situ* by tampons, they readily fall out and necessitate rest on the part of the patient. They are especially valuable where the tampon and irrigation cannot be used, as where the introitus is very narrow and sensitive (in children and in virgins.)

While we have spoken of the disinfecting methods which are of the greatest value in the treatment of vaginal catarrh, we have often noticed the therapeutic effect on the tissues, whereby, in a measure, disinfection is accomplished through changes in the abode of the carriers of infection. Aside from this latter action, it may be necessary to expedite the cure by applications which lead to regeneration of the epithelium, which increase the muscular tone, and which control the circulatory and secretory disturbances. Local changes in the mucous membrane affected by chronic catarrh require such treatment. Thus papillary excrescences can not always be caused to disappear without excision and cauterization, although they often yield to the dry treatment, thus also do erosions of great extent heal more quickly by applications of wood vinegar, which, as Hoffmeier has pointed out in case of erosions of the cervix, favors the regeneration of the epithelium; further still, astringents of various sorts, when not used too long, unquestionably exert a good effect on the relaxation and hypersecretion of the mucous membrane.

Thus then, if we do not at the outset grant that these agents combined with the former have an anti-bacterial action, do we pass from the disinfectants to the astringents.

Vaginitis Exfoliativa.—In connection with the catarrhal inflammations we will speak of the rare affection, vaginitis exfoliativa, where, periodically, accompanied by dysmenorrhœa, epithelial membranes are cast from the vagina. Since Arthur Farre recorded the first instance of this affection, many writers have noted the simultaneous expulsion of dysmenorrhœal membranes from the uterus. In the last recorded case, the membrane was also expelled at longer or shorter intervals in the intermenstrual periods, although most frequently coincidently with menstruation. (Tyler Smith.) The vaginal mucous membrane generally shows catarrhal changes, such as congestion, loosening, and hypersecretion, which, true enough, cannot always be differentiated from similar menstrual phenomena. Cohnstein witnessed an instance, and, from a study of the literature, came to the conclusion that exfoliative vaginitis was etiologically connected with uterine membranous dysmenorrhœa, and found that both processes were generally excited by general, rather than by local, disturbances, that is to say, by hysteria. Since local treatment is unavailing, Cohnstein recommended agents directed towards hysteria, in particular, the bromide of potass. In regard to diagnosis, we must differentiate from epithelial membranes the result of sloughing not infrequently following the use of alum. Other superficial sloughs, like those caused by nitrate of silver, sesquichloride of iron, etc., may be more readily distinguished.

I have never had an opportunity to see a case of exfoliative vaginitis, but I can prove the causal connection between hysteria and severe vascular disturbances in the mucous membrane, which Cohnstein claims is the factor in vaginitis exfoliativa, by the relation of the following case: Since 1878, that is to say, for seven years, I have known a woman, of middle age, who from childhood up has been subject to varied hysterical manifestations. Since her last delivery, the fourth, she has suffered from leucorrhœa and profuse menstruation. The hysterical symptoms were more marked, and she complained in addition of nervous dyspepsia, cardialgia, and supra-orbital neuralgia. She was inclined to corpulency, was anæmic, and had a tendency to diarrhœa. The thoracic and abdominal organs were sound, the kidneys, as well. The uterus was slightly enlarged, relaxed, retroposed and anteflexed, movable; the anterior lip of the cervix was hypertrophic. On the vaginal surface reaching to the external os, was an atonic, sharply-demarcated, grayish-white erosion, and the cervix secreted a profuse white mucus. The vagina and the posterior lip of the cervix, beyond slight injection, were normal. The uterine adnexa were not enlarged. The erosion did not yield to the ordinary method of treatment. In 1879 I excised the eroded lip and closed the wound with silver sutures. Union by first intention occurred, and for awhile the general symptoms were bettered. But soon the erosion recurred on the posterior lip, and although it was immediately excised, the former result was not obtained. Dr. Wilhelm Fischel examined the excised portion and pronounced it to be an ordinary ulcer. The erosion thence quickly spread over the posterior vaginal wall, and in addition there were present isolated, sharply circumscribed white spots on the mucous membrane, very vascular. These spots were dry and smooth; they felt soft, and their neighborhood was no more swollen or injected than the rest of the vaginal mucous membrane. There existed profuse secretion and great hyperæsthesia on examination. Menstruation was more profuse and irregular, and the anæmia was, in consequence, intensified. The appetite failed, the diarrhœa increased, the spasms recurred more frequently. The woman suffered from attacks of oppression and from fainting fits, from great muscular weakness; later the inguinal glands enlarged and became painful, and a crop of furuncles broke out. Frequently ephemeral fever was noted, which was not always associated with the appearance of the furuncles.

The vaginal erosion, which was the only constant pathological local finding, resisted all treatment, antiseptics, astringents, aromatics, caustics, alterants, heat and cold, dry, wet, and ointment tampons, permanent irrigation, without more than transient effect. At the same time, the interior of the uterus was treated. The white erosion simply extended. The general hysterical treatment, which Cohnstein advocated in case of exfoliative vaginitis, was not neglected, with the precaution, during its administration, to intermit the local treatment. All sorts of cures, baths, electricity, etc., were without effect. Frequently carcinoma and rodent ulcer were suggested by my consultants, but I could never detect anything but superficial changes, there being no infiltration or deep extension of the process. I am able to explain the case purely on the association of changes in the circulation and local nourishment accompanying hysteria.

Owing to the great tendency and the ability of the hysterical to simulate everything, it is very difficult to explain marked symptoms from the side of the circulatory and secretory organs, such as hæmoptysis, rapid discharge of unchanged fluids, as milk, per rectum, and the like, on the score of perverted innervation, although there is no ground for doubting the action of abnormal innervation on the secretions, and on the contraction of the blood-vessels. The protracted constipation which is witnessed in the hysterical without appreciable disease of organs, the marked decrease in the amount of urine secreted and in its concentration, these must be accounted as sequelæ of the hysterical neurosis. In our case the conditions find their explanation in chronic hysteria of high grade which had existed for a number of years.

A peculiar membranous exfoliation of the superficial layer of the mucous membrane has been described by Winckel under the name colpitis gummosa. In a twenty-eight year old nullipara, who since her sixteenth year had had molimena every four weeks, and since her seventeenth had suffered from leucorrhœa, who at twenty-two began to menstruate every six months, and had never had any ulceration on her genitals, Winckel found the following: The vulva was reddened to the *mons veneris*, the labia not swollen and dry, the rima closed. On separating the nymphæ, a gray, partially adherent, partially desquamating membranous layer was seen, which began above the urethra, and spread over the anterior vaginal wall, along the inner surface of the nymphæ, down to the posterior commissure and thence over the entire vagina. Externally it terminated sharply at the frenulum, and above at the vaginal vault; on one occasion alone, a portion the size of a pea was found adherent to the posterior lip of the cervix. The external os was entirely smooth; there was no cervical discharge. The membranous layer, a number of lines thick, could be removed with the forceps, and the mucous membrane beneath it was pale red. The insertion of the finger and the speculum was difficult and painful, although there was no hemorrhage. The condition had lasted for about three months. A year previously she had been treated for the leucorrhœa and for pain in the back and abdomen. The patient had no fever.

The reaction of the secretion was highly acid. On microscopic examination the layer was found to consist in numerous fat corpuscles, like cells, partially containing crystals in the shape of needles; these bodies dissolved in ether. There existed also a thick layer of partially cornified epithelium.

Birch-Hirschfeld examined a portion excised from the neighborhood of the introitus and reported that the epithelium was markedly thickened, the upper layers being partially converted into membranous lamellæ; the rete malpighi contained large cells, and was much thickened; the papillæ were hypertrophied, the sub-mucosa greatly thickened and filled with many thick-walled vessels; the tissue was infiltrated with round and spindle-form cells, so that the appearance was similar to that obtained from fresh sections of a gumma.

Winckel watched the patient for four and a half weeks. Within two to three days, on the parts whence large pieces of membrane had been removed, nodules the size of a pin's head formed anew, grayish in color, which quickly coalesced into membrane. For two days she lost a slight amount of blood (menses), and on the third day Winckel found the entire vagina filled with a boggy, black mass which was shed, and then the previous membranous formation recurred.

It is interesting to note that the case was complicated with a chronic affection of the left eye, which had existed since her nineteenth year, and had been repeatedly treated. At the time Winckel examined her, the conjunctiva was covered by a layer very similar to that in the vagina, the cornea being partially cloudy and the pupils prominent. In addition the patient had had an eruption on the face and arms, which had yielded to inunction with some ointment. She did not cohabit till afterwards. Examination revealed no sign of syphilis, and the affection was neither cured nor bettered by protracted use of anti-syphilitic remedies.

Far more infrequent than the catarrhal are the exudative inflammations of the vagina.

Vaginitis Diphtheritica.—Croupous and diphtheritic changes in the vaginal mucous membrane have been frequently noticed since Rokitansky called attention to them, although the identity of the process with that in the pharynx and the larynx, has only been settled in the minority of cases.

Klebs, who admits the occurrence of true croup in intense inflammations of the vaginal mucous membrane, describes further, as diphtheritic, the changes which are seen in lacerations at the introitus in puerperæ; the dirty yellow, adherent layer, which frequently remains unchanged for some time, and again is said to give way to purulent and granulation changes, or else becomes the seat of suppuration. In secondary diphtheria, which developes in the course of acute infectious diseases, cholera, variola, scarlatina, measles, the vaginal mucous membrane, according to Klebs, is reddened, ecchymosed, and on its surface there are generally, in groups, small elevations, grayish-yellow in color; the superficial layer necroses, and is shed in patches, or later in large pieces, and is then usually described as croup. Schroeder calls attention to the fact, that in addition to the extensive croupous and diphtheritic processes seen in puerperal women, and also after gonorrhœa and in the course of acute infectious diseases, we often find whitish, more or less adherent layers as the result of some local traumatism (irritation by purulent secretion, fistulæ, etc.) In case of the general diphtheria accompanying acute infectious diseases, the swelling in the vagina attains the highest grade, so that, as in a case seen by Schroeder, the recto-vaginal septum may form a thick tumor, and the vaginal folds and the cervix may be so swollen that the finger cannot reach beyond the cervix. On the mucous membrane are found white and green diphtheritic membranes, and there exists a foul, purulent discharge. Occasionally the cervix is implicated, extension taking place to the cervical mucous membrane which is greatly swollen.

Vaginitis Dysenterica.—Klebs describes similar dysenteric changes as occur in chronic dysentery. Eppinger, later, examined twelve cases, and described the affection as a dysentery of the vagina (kolpitis dysenterica). In all the cases there existed dysentery of the large intestine, and the process was supposed to extend into the vagina owing to patency of its orifice, or narrowness of the perineum.

The microscopic changes were most marked at the introitus, that is to say, at the end of the ant. and post. columna. Flat, or irregularly formed ulcers, or spots of superficial necrosis with greatly injected base are found in various places. Loose, flocculent masses of exudation are on the ulcers. Spread out over the folds small yellowish spots are found which are partially adherent, and, again, may readily be removed. Eppinger considers these spots as the beginning of the disease, the catarrhal stage, and in the further development they change into necrotic patches, grayish-yellow in color, of varying depth, with sharp hemorrhagic demarcation. Through partial shedding of the slough there results loss of substance, extensive ulcers, between which are islets of mucous membrane. Microscopically, the patches are seen to consist of broken-down portions of the epithelial layer. Between the patches are colonies of micrococci in connection with similar ones in the sub-epithelial layer. It regularly happens that large portions of the epithelium in their entire thickness are lifted up by these masses of cocci, and there remain ulcerated patches entirely deprived of epithelium, from the base of which the denuded papillæ project, which are also covered with micrococci. In certain parts Eppinger was also able to detect the extension of the micrococci deeply down along the papillæ. These micrococci were not carefully examined by culture experiments; but Eppinger states that they were never grouped together in cylinders, but were irregularly distributed, and that they were larger and paler than septic cocci, single individuals possessing the power of motion.

Whilst the patches and the superficial erosions depended on mycotic epithelial necrosis, the process appeared to extend more deeply where the circumscribed yellowish dry scabs existed. The structure was not recognizable, only the thrombosed vessels were prominent. At the line of demarcation the vessels were widened, and the tissue infiltrated with small cells. The micrococci were only exceptionally found. In the stage of ulceration, in one marked case, the borders were formed of overhanging epithelium the lower surface of which was covered with a thin layer of pus in which projected stumps of vessels, filled with coloring matter. Underneath the pus layer there was granulation tissue, and in places the suppuration extended into the depths.

As regards the method of infection, Eppinger concluded that the micrococci caused a loosening and a separation of the epithelial layer, even as Bumm has latterly shown occurs in case of gonococci, and that contact with the dysenteric dejecta caused extension to the vaginal mucosa. In favor of this view, the frequently observed patent vulva and site of election at the introitus speak.

Vaginitis Erysipelatosa.—Eppinger has also described an erysipelatous inflammation of the vagina: On the body of a woman of thirty-five, who had died of erysipelas on the twelfth day of the disease (which began in the face, disappeared from there, and on the tenth day, was seated on the left thigh and hip), Eppinger found reddening and swelling of the nymphæ, especially on the left side, where also on the inner surface of the labium majus, the epidermis formed bullæ the size of a bean. The mucous membrane of the vagina, as far as the fornix, was swollen and reddened, and in places, wrinkled. On the posterior wall, three-quarters of an inch above the commissure and as far as the middle of the vagina, there was loss of substance for a space the breadth of the little finger, which was covered with swollen epithelium, in places elevated in blebs, and the base of which was formed by a greatly reddened, thin, whitish exudation. Similar small patches were found laterally and on the anterior wall. Where the epithelium was intact it could be readily separated. The sub-epithelial and sub-mucous tissue was softened, moist, reddened.

The fluid from one of the small blebs by the side of the ulcer contained the pale, movable, monadinencocci (Klebs). Similar cocci were found in the epithelium from the foot; in the deeper tissue-layers and in the blood they were not detected. Where the epithelium was intact, it was swollen, and the cells contained vacuoles. The papillæ were broadened, and the vessels were injected. The cellular infiltration extended in portions down to the muscular layer. The epithelial and sub-epithelial layers intercommunicated. The deep vessels of the vagina were much widened; the muscular layer was unchanged, and the mucous membrane of the cervix and the uterus, as well.

Eppinger's case, which was seen before the appearance of Fehleisen's work, is, as far as I know, the only one in which erysipelas extended to the vaginal mucous membrane.

Vaginitis Septica.—Of the septic changes in the vagina, the slough and ulceration on infected wounds in puerperæ, which Klebs has called wound diphtheria, are best known. Less attention, anatomically, as well as clinically, has been paid to the septic changes in the intact mucous membrane, although they are of not infrequent occurrence on the nymphæ, in the vagina and on the cervix, as the result of the action of septic secretion. W. Fischel has often spoken of epithelial necrosis in septic puerperæ, without going into a detailed description. Eppinger states in regard to the differential diagnosis between dysenteric and septic necrosis, that the former invades by preference the lower extremity of the columnæ.

These changes are most frequently found in puerperæ. On intact portions of the mucous membrane, as, for instance, on the borders of the nymphæ, on the cervix, on top of the vaginal rugæ, and in particular on the edge of the columnæ, are found dry, yellow spots, isolated, on the level of the mucous membrane, which can only be removed with the epithelial layer. In extreme cases they may extend over the entire vagina, and resemble a diphtheritic exudation. Although these spots are not particularly injected, the mucous membrane under them is swollen and inflamed, especially on the apices of the rugæ and columnæ, and it is reddened. Without doubt, the inflammatory processes, as well as the epithelial necrosis are due, in general, to secretion from the uterus containing septi cocci, and in proof of this we have seen a marked instance where there could be no question of extension from an ulcer. In a case of atresia hymenalis, to which we have referred, where, after a small perforation; there occurred purulent degeneration of the retained blood, there formed a septic colpitis which spread over the entire vagina with yellow adherent deposit on top of the thickened rugæ. During the course of antiseptic treatment these deposits remained unchanged for days, and the epithelium reformed without there being at any time an erosion; in other cases, on the contrary, where antisepsis was not attended to, there remained after separation of the deposit, flat, yellowish ulcers, which spread irregularly in depth and in width. Such ulcers have been noted by Eppinger at the extremities of the columnæ.

Symptoms and Course.—All exudative inflammations of the vagina, whether they are diphtheritic, due to sepsis, or else complications of infectious diseases localized elsewhere, such as cholera, typhus, the acute exanthemata, erysipelas, dysentery, are associated with high fever. The local symptoms are generally slight. When the patients have not a profuse purulent discharge with necrosed masses, they complain of ischuria and of burning in the region of the pubes. In case of diphtheria of the vagina, Schroeder mentions pain in the pelvis, bearing down pains, vaginismus and painful defecation, as the symptoms, and he has exceptionally noted more marked symptoms in case of more intense and extensive inflammatory swelling.

The less marked the local symptoms the less likely is the physician to make a vaginal examination whereby the diagnosis can alone be reached. This is probably the reason why the number of clinical observations of these affections, where the anatomical changes are described, are few.

Even in case of puerperal sepsis the vagina in general practice is rarely examined with the speculum, although it is essential to seek for the source of the infection in the genital tract. The more likely hence that an exudative inflammation of the vagina, dependent on some other infectious process, should be frequently overlooked.

The course and the prognosis of these complications may be modified, however, in cases of medium severity by appropriate treatment, and overlooking the inflammatory process may inflict much damage on the patient. When the process is left to itself, it changes into more or less extensive ulceration, which may lead to atresia and union of the vaginal walls. Under bad local conditions the tissue may necrose, and abscesses in the pelvic cellular tissue may form, which may seriously imperil life.

The treatment of all these forms consists especially in the use of disinfectants. The more deeply the infectious agent has penetrated into the tissues, the more essential it is that the disinfection should not alone consist in occasional injections, but that agents should be used which will thoroughly change the ulcerated surfaces, and prevent the growth and the extension of the infectious agent. Strong caustics are not appropriate, since they themselves act as strong irritants. Our results in cases of septic vaginitis lead us to favor tincture of iodine, which we either paint over the surfaces, or else in severe septic vaginitis pour through a speculum. The stronger solutions of permanganate of potass have also proved serviceable.

It is of advantage, especially in septic inflammations, to insufflate iodoform in order to guard against, for as long as possible, decomposition of the secretion. As to whether one or another disinfectant is preferable in the treatment of diphtheria and other forms, has not been as yet established.

PERIVAGINITIS PHLEGMONOSA.

A third group of inflammatory affections of the vagina is formed by phlegmonous perivaginitis (dissecans), where, in contra-distinction to vaginitis, not the mucous membrane, but the perivaginal connective tissue is the chief seat of the process, the extension of which sequestrates the vagina, so that eventually, together with the vaginal covering of the cervix, it is thrown off. In the majority of cases both the mucous membrane and muscular layers are affected. This rare affection was first described by Marconnet, who saw two cases in young women, both of whom recovered. As regards etiology there are no data. Although Minkiewitsch's patient died of typhoid fever, as also Tschernüschew's, in the second case of the last observer there existed a febrile affection of three weeks' duration where no diagnosis was reached. Bizzozero's patient died of pneumonia. In the case recorded by Syromiatnikoff, and seen by Zirkunhenko, gonorrhœa may have been the cause. At least, she stated that two weeks before the onset of her disease, her husband complained of great pain on micturition, and that her disease began with leucorrhœa, and two days afterwards severe pain on micturition and fever set in. In the remaining cases (Marconnet, Wiegandt) no definite etiological factor was determined although all three cases appeared at the menstrual period.

In all the cases there was fever; in Marconnet's, Bizzozero's, Tschernüschew's cases there was slight hemorrhage; in the remaining cases there was only a purulent discharge. Great pain was present in all the cases; the labia were always swollen, and occasionally ulcerated. The vaginal mucous membrane was swollen, pale, and, except in Marconnet's cases, where the blood supply was not entirely cut off, it was discolored and necrotic. The expulsion usually occurred spontaneously, often at stool. Bizzozero removed the sequestrated skin by slight traction. With the exception of Minkiewitsch's case of severe typhoid, all recovered after suppuration and granulation. (Syromiatnikoff's case is not counted among the fatal, since she was discharged cured, and died a few months later from rupture of a pelvic abscess into the peritoneal cavity.)

It is of interest that as much atresia and union of the granulating surfaces did not occur in all the cases as was to be expected.

In both of Marconnet's cases the vaginæ remained patent, although he only kept them a short time under observation. Tschernüschew's cases give us no data except that they were discharged cured. In the remaining cases great stenosis resulted in consequence of the peri-vaginitis; nevertheless in Wiegandt's case pregnancy ensued within a year.

The treatment aims, of course, at modifying the complications, and until the expulsion of the membrane it consists in the strictest possible antisepsis, camphor, iodoform, careful cleansing of the genitals. As soon as the separated parts can be removed without injury this should be done.

After expulsion the canal should be irrigated with carbolized water, and the like, and tampons smeared with some ointment should be inserted, or else iodoform gauze, to control the tendency to shrinkage.

In addition to peri-vaginitis phlegmonosa, there occur phlegmonous inflammations in the peri-vaginal connective tissue as the result of gravitation of pus from pelvic abscesses. They are far more frequent, and ordinarily affect the posterior vaginal wall, although their seat depends on that of the primary affection, and hence may be met with elsewhere. These peri-vaginal inflammations lead rather to fistulous communications than to undermining of the mucous membrane. In the recto-vaginal septum perforation rather occurs towards the rectum than towards the vagina, in the median division; in the upper and lower division, on the contrary, they more frequently perforate into the vagina. The incomplete evacuation of the pus through the fistulous opening is the reason for the extension and chronicity of the process, and the treatment should aim at making a free outlet. Finally, we must refer here to the chronic perivaginal inflammations which develop as the result of syphilitic ulceration in the rectum and from periproktitis, and which are characterized by cicatricial contraction of the cellular tissue, there existing fistulous communication with the rectum.

Of the remaining infectious processes in the vagina we must still speak of:

SYPHILIS.

It is not possible to state how often the vagina is the seat of syphilis, since often in the recorded cases the presence of the disease in the vagina and on the cervix are confounded. For both together E. Klink, from his personal observation and from a search through French and German literature, concludes that the ratio of chancre is here to that in other localities as 8:322. According to Kaposi soft chancre is rarely met with, although more frequently than hard; Kaposi saw two cases within three months. Of 249 hard chancres of the female genitals Fournier only found one on the vaginal mucous membrane. Klebs also states that the primary lesions in the vagina often lack induration.

Heitzmann gives an excellent description of the specular appearances. The peculiarities of the soft chancre he states to be the following: Sharply reddened, slightly elevated borders, sinuated and uneven base, and speckled purulent layer. The peculiarities of these ulcers in the vagina are: the destructive process extends more on the surface than in the depths, whence the shallow base, great tendency to unite with others, and hence there results an extensive ulceration surface with sinuous indented edges, the surface being covered with profuse secretion and necrosed masses. In this locality their progress is slow. The usual seat of the chancre is at the introitus: in the vagina, it is almost always found in the anterior third and most frequently in the anterior wall. Exceptionally, Heitzmann found it in the posterior fornix, whence it had extended on to the posterior lip. In healing, the slough separates from the borders and is shed after profuse suppuration; the epithelium is regenerated from the periphery towards the centre. When the process has not extended deeply, no cicatrix remains, and when one does, it is pale, smooth, shiny. Hard chancres, according to Heitzmann, are ordinarily found at the introitus, next to the posterior commissure. He was never able to detect characteristic induration higher up.

Secondary syphilitic changes are relatively more frequent, although, as regards the vagina, there are but few recorded instances. Heitzmann describes erythema syphilitica, and also a form analagous to psoriasis, and the mucous papules (broad condylomata.) In case of erythema there exists a more or less circumscribed catarrhal inflammation of peculiar nature and course. At first the mucous membrane is only diffusely reddened, without marked swelling; soon at certain portions a more intense redness appears. Ordinarily the anterior third of the vagina is the seat of such circular erythema. At the same time a similar change is sometimes seen on the cervix. These reddened portions, in certain instances a few small, separate spots, are very sensitive and vulnerable, slight touch causing them to bleed.

Either the erythema disappears in a short time (8 to 10 days) spontaneously, or else a peculiar cloudiness affects the diseased portions, or finally papules form on the erythematous base. The erythema recurs rapidly, and the secretion is not purulent like that of gonorrhea, but more watery and milky; complication with virulent catarrh is, however, met with. With regeneration of the epithelium, young fungous epithelial cells are sometimes formed, which, arranged in thick layers, cause the red spots to look white and opaque, as though they had been touched with lunar caustic. The process, according to Heitzmann, is analogous to psoriasis linguæ and psoriasis syph. cut., only that, in consequence of the bathing of the parts by the increased secretion, the upper layers do not become dry, and therefore no desquamation is noticeable.

Of French authors Courty speaks of changes which belong here. "Especially under the influence of syphilis, we see in the vagina (particularly on the cervix) circumscribed, round, coin-like thickenings of the epithelium, which look like drops of wax, and which are differentiated by their pale white color from the red surrounding parts. These are a species of psoriasis, *plaques,* which are surrounded by a red surface, occasionally ulcerate, yield to specific agents, and yet may remain unchanged for a long time. In other instances they increase in thickness and consistency, and form either broad condylomata, or else small hard elevations."

The mucous papules, described by Heitzmann as generally rising from the erythema, are always markedly elevated, although in comparison with the same efflorescence on the external skin of the genitals they do not form such characteristic nodules. According to Zeissl they only are typically papillar when they are seated on mucous papillæ. They are ordinarily more characteristic on the cervix than in the vagina.

At the outset we see red, slightly elevated, flat surfaces the size of a pea, generally arranged in groups and quickly running together, thus making large plaques. In case of accompanying virulent catarrh, the papules swell quickly. The surface becomes eroded and bleeds readily. Occasionally, from changes in the epithelial layers, they become cloudy and look like mother of pearl (*plaques opalines* of the French). The papules do not then disappear as quickly, and after atrophy there remain milk-white patches. If instead of thickening there has occurred shedding of the epithelium, then the denuded papillæ swell into papillary nodules.

A second metamorphosis of the papules consists in their molecular degeneration. In the beginning the condylomata seem to be covered with a thin diphtheritic membrane. They are dirty gray, their convexity is rough. The breaking down begins in the centre and is there far advanced, whilst the periphery is still intact. The papules then resemble very much specific ulcers, especially when the borders are not very elevated.

In the diagnosis of syphilitic affections of the vagina, the characteristic marks will answer in the majority of cases, particularly since ordinarily there are present at the same time changes due to the same disease on the external genitals, skin, etc. Still, in case of isolated ulcers, the diagnosis may be so difficult that it is only reached on the appearance of secondary symptoms.

The local treatment is similar to that which we have laid stress upon under the subject of catarrh. The general treatment is the usual one.

TUBERCULOSIS OF THE VAGINA.

Tuberculosis of the vagina is of peculiar interest, not so much on account of its rarity as because of the fact that it has been usually noted as secondary to advanced tubercular processes elsewhere. I find but a single brief reported case (H. Thompson) in which the reporter found cheesy masses in the vagina, which he considered the starting-point of general tuberculosis. Although I do not consider the fact proved in the case, it is still worthy of record: A previously healthy girl of 15, who had never menstruated, died of an obscure affection of five days' duration, characterized by elevation of temperature, anxiety, livid coloration. At the autopsy miliary nodules were found in the lungs, on the diaphragm, and in the capsule of the liver. In the liver, spleen, and kidneys were large nodules, partially caseous, and the same at the base of the bladder and in the fossa sylvii. The hymen entirely closed the vagina, which was dilated into a sack in which was about 1¼ pounds of semi-fluid, grumous, foul substance, consisting of retained, decomposed menstrual blood. The cervix and the os uteri were covered with numerous miliary tubercles.

Tuberculosis of the vagina is not always, as Klebs has claimed, the result of extension of tubercle from the uterus. In Virchow's, Weigert's, Klob's, and Kaswarowa's cases the uterus was not affected. In such instances tuberculosis of some other of the pelvic organs is never lacking; the urinary organs, the intestines, the peritoneum, are more or less affected. In a case of cheesy degeneration of an ovarian cyst in an old woman, I personally saw a tubercular ulcer on the posterior wall of the vagina in the fornix. Tubercles in the vagina appear as small gray nodules arranged in groups on a reddened base, thickest in the middle of the vagina and in the fornices (Virchow), or else as larger elevated patches with cheesy, eaten-out base and steep edges (Weigert). In all the cases since Koch's discovery the tubercle bacilli were found.

In so far as treatment is to be effective further observations must show. Iodoform should at the present head the list of agents.

GANGRENE OF THE VAGINA.

Gangrene of the vagina, when not the result of pressure by a foreign body or of the fetal head, appears as noma. According to Klebs it is not infrequently consecutive to noma of the cheek, and as diffuse gangrene, following, in general, on diphtheritic processes of the mucous membrane. Frequently the etiology is obscure, as in Obre's case, which Klebs considered an instance of diffuse primary gangrene.

In such extensive processes the entire vaginal mucous membrane, with the exception of the covering of the cervix, appears black, pulpy, and there are present superficial necroses in the vestibule or on the labia. Pain, dysuria, inability to walk, result. Fever is not constant; in a case which I saw, where the gangrene was consecutive to the wearing for seven years of a round pessary by a woman of fifty-seven, fever was entirely lacking. In certain instances there is profuse hemorrhage; in Obre's case, a girl of fourteen, the hemorrhage was fatal.

The treatment is by antiseptics. In the cases we have seen, frequent irrigation followed by insufflation of iodoform gave good results. The use of camphor is to be commended.

ROUND ULCER.

Under the term *ulcus rotundum simplex* W. Zahn describes a round ulcer with sharp border and red base which he found in the posterior fornix of a woman of seventy-six. The borders, like the rest of the mucous membrane, were pale, there was no induration, the base was hyperæmic and covered with a layer of pus. The connective tissue was infiltrated with small cells, and the borders contained smooth muscular fibres in a state of fatty degeneration. Colonies of micrococci were present. The uterine artery and its branch, the vaginal artery, were stenosed to a high degree, so that the lumina were reduced to the minimum, and a branch of the latter, leading to the ulcer, was completely obliterated.

The ulcer resembled, according to Zahn, the round ulcer of the stomach, and he states that this unique ulcer depended on the cutting off of the blood supply and the lack of a collateral circulation.

CHAPTER VIII.

NEW GROWTHS OF THE VAGINA.

A. CYSTS.

CYSTS of the vagina are rarities, although during the past few years the recorded instances have increased. They are found, ordinarily, as isolated tumors in the mucous membrane or sub-mucosa of the vagina, at times two to three in number, rarely more; Schroeder on one occasion extirpated six at a sitting.

The site is a trifle more frequent on the anterior than on the posterior wall, more rarely on the lateral walls. In one case (Bastelberger) the hymen was implicated. The size varies between that of a pea and a hen's egg, although it may, as in J Veit's case, attain that of a child's head. Very large cysts may implicate the entire length of the vagina, as Nélaton saw on the posterior wall, Credé (Hörder's report) on the anterior and J. Veit on the lateral. The contents are at times serous, then gummy, slimy, or emulsion-like, similar to lime (from admixture with cholesteatomatous material), and occasionally blood.

Microscopically, epithelium, granular cells, fat-drops, at times crystals of cholesterine, pus and blood, are found. Exceptionally the clear fluid contains no morphological elements.

In the majority of cases the inner wall of the cyst is lined with cylinder epithelium (Ruge), although laminated epithelium is also found in the same cyst near the cylindrical (Mayer, Lebedeff, Ruge).

The epithelial cyst-wall consists, in superficial cysts, of a thin layer of finely fibrillated connective tissue; in thicker wall cysts there is often a mucous membrane. (Muscular and connective tissue layers, rarely well developed papillæ. Ruge, Garrigues.)

A cyst, described by Kaltenbach and examined by Mayer, had a very unusual complicated structure. It resembled a cystoma, a section of which was papillary, and another was glandular in characteristics. In a few instances the epithelial lining was totally wanting (Huguier, Ladreit, Verneuil, Lebedeff).

The anatomical origin of vaginal cysts has not, as yet, been entirely settled; still, the examinations which have been made point to variations in the local origin. Aside from cysts arising from other sources and growing towards the vaginal wall, the deeper cysts covered by mucous membrane originate from persistent parts of Müller's and Wolff's ducts; the superficial cysts, with simple connective tissue walls covered with cylindrical or laminated epithelium, like those described by von Preusen, although exceptionally, yet they originate from vaginal glands.

In all these instances vaginal cysts have the importance of retention cysts. Klebs has described them as lymphatic cysts in the connective tissue, lined with endothelium, and possibly formed from dilated lymphatics.

The case of Freund (hæmatokolpos) and Cullingworth's blood cyst, Smolsky's and Kleinwächter's cases of pyokolpos unilateralis, and the case of Gräfe (from Schroeder's practice), where six cysts lay below one another, the lowest of which projected into the vagina, and were arranged spirally from the right backwards to the left, from the introitus to the fornix, these are instances of development from a remnant of Müller's ducts. Although the contents of these cysts were varied, serous, slimy, clear and brown, still the wall, a few lines thick, was muscular, and the inner surface was covered with papillæ and cylinder epithelium. Of the same origin, I believe, are two vaginal cysts in new-born infants, the one seen by Winckel and the other by myself.

Winckel saw in a new-born, strongly built infant, a vaginal cyst the size of a cherry, which interfered with micturition. When the child cried a tumor with vascular wall projected through the hymen, between the nymphæ. The tumor proved to be a cyst occupying the left side of the anterior vaginal wall, and adherent to the neighboring part of the hymen. He was able to penetrate into the vagina to the right of the tumor. The orifice of the urethra was occluded by the tumor, and the urine was directed to the right and posteriorly over the hymen; the rectum was normal. An incision let out a teaspoonful of a milky cheesy fluid in which were numerous laminated epithelial cells, fat, but no cholesterine. After puncture the urine was passed without difficulty. The meatus urinarius was in its usual place. The cyst shrivelled, and after the twelfth day only a small elevated linear cicatrix was apparent.

In April, 1873, I saw an analogous case in a healthy seven weeks old, breast-reared infant. A cyst, the size of a hazel-nut, with relaxed walls and furrowed surface, spreading from the anterior vaginal wall backward and to the left of the meatus urethræ, was prolapsed through the widely dilated hymeneal orifice. The little finger could be passed into the vagina behind the tumor, and the attachment of the cyst as well as the normal state of the posterior vaginal wall and of the cervix could be determined. There was no disturbance of micturition, and the cyst did not trouble the patient. Artificial opening was not allowed by the parents. It probably broke spontaneously, since the family physician reported later that it had shrunk.

In neither of these cases was there an anatomical examination, and therefore no definite statement can be made in regard to the source. The site, the thickness, the vascular wall, and the nature of the contents in Winckel's case, speak for their having been due to a closure of a rudimentary segment of the anterior vaginal wall. This is more likely than the belief in their origin from a crypt near the meatus urinarius, since in the new-born, when they are developed at all, these crypts are very shallow.

In favor of the derivation of these cysts from rudiments of Müller's duct, the following points speak: They are simple or multiple cysts, arranged longitudinally, and never extending above the fornix towards the broad ligament, they are usually in the axis of the vagina, in the middle or to one side; the base of the cyst wall consists of developed mucous membrane (muscularis, papillæ, with pavement epithelium); the wall is thick; there is no connection with the urethra; there is occasionally also present a uterus unicornis (Freund).

As regards the bloody and the purulent contents of such vaginal rudiments, Kleinwächter points, with reason, to the influence of pregnancy and of labor, and even in Freund's case traumatism of labor must be considered the cause of the blood in the cyst, although he thought it was dependent on menstrual separation of the vaginal mucosa. Such rudiments may exist for years without symptoms, until the appearance of hypersecretion or hemorrhage, or else of prolapse.

In regard to the origin from persistent remnants of Wolff's or Gärtner's ducts, to which G. Veit first called attention, two instances have recently been recorded where this seemed to be the case.

In one case (Robert Watts) the woman was forty-one years old, had borne eight children, and for three years a cyst, the size of a hen's egg, attached to the anterior vaginal wall, had prolapsed, and it spread upwards into a slender duct, in which a sound could be passed without difficulty towards the left side for a number of inches, so that the point of the sound could be felt through the abdominal wall at the level of the umbilicus, between it and the ant. sup. spine of the ilium. Only the lower cystic portion could be loosened from its bed, and it was removed after ligature of the upper and neck-like extension. The point of removal was just above the reflexion of the vagina from the cervix, and the lower end of the cyst was about one half an inch behind the urinary meatus. Frequent examinations with the catheter proved that it had no connection with the bladder. The contents of the cyst was about two ounces of a sero-purulent fluid.

Garrigues examined the extirpated cyst and found the smooth inner surface covered with pavement epithelium, and about a dozen recesses, the smaller of which were round, while the larger were transverse. Underneath the epithelium of the thick wall there was a thin layer of connective tissue containing round cells and many capillaries, and externally there was a normal muscularis.

During and after the operation there was hemorrhage from the upper part of the wound which required the tamponade. During two days the urine was bloody, but it then became clear, and the cavity gradually closed. Watts states that analogically the site was that of the vas deferens, and he finally reaches the conclusion that it was a cyst of Gärtner's duct. If his supposition be correct, then the bloody urine must be considered the result of excoriation of the mucous membrane of the bladder by the repeated catheterization.

A second very uncommon case is considered by the reporter, J. Veit, to be an instance of cystic development of a persistent Wolffian duct. In a woman of forty-seven, who had borne a number of children, there had existed a prolapse for a number of years, which it was difficult to rectify and which caused retention of urine. Veit found the prolapse only from the right side of the vagina, and the size of a child's head. The urethra was entirely dislocated downwards; the left wall of the urethral projection was normal; to the right, where there was no *cul-de-sac*, the urethra spread over the prolapse. To the left the finger penetrated into the compressed vagina, and reached the cervix, which was unchanged, as also the anteriorly flexed uterus. The uterine adnexa could not be felt without anæsthesia, but the uterus was greatly pushed to the left by a swelling in the right broad ligament. There was no rectocele. The catheter could not be inserted into the prolapse. Examination under anæsthesia revealed a tense tumor in the broad ligament, which was in connection with the cyst in the vagina. Above the tumor the ovary could be felt, and on the left side the adnexa were normal. Veit incised the prolapsed portion as freely as he could without injury to the vessels, and then sewed the edges to the vaginal mucous membrane.

The fluid contents were exactly like those found in dermoid cysts, although neither hair nor teeth were present. The wall of the cyst was covered with pavement epithelium. After emptying the cyst the finger could be passed above the pelvic inlet and could feel the upper end of the ovary. The cyst quickly shrunk. There is no statement in regard to the texture of the cyst.

The reasons for the belief in the development of vaginal cysts from remnants of Gärtner's duct are their deep seat more to one side, and their mucous covering with an epithelial layer, which from the method of development of the epithelium need not necessarily be simply cylindrical. Not much can be said in regard to difference in structure between cysts from Müller's and from Wolff's ducts. Presumably the cysts from Müller's ducts should show greater development of the papillæ of the mucous membrane. The only valuable differential diagnostic point is the fact that cysts from Wolff's ducts may extend above the fornix vaginæ into the broad liagment up to the neighborhood of the ovary, and this can never happen in case of those from Müller's ducts. The difficulty in differentiation is, however, still great, and we must await further observations.

As regards the origin of the vaginal cysts from the vaginal glands (von Preusen), although exceptional, it has been proved by a number of observers. C. Ruge determined this in a case of hæmatocolpos internally to the hymen; Hückel and Heitzmann have observed cases exactly like von Preusen's. These cysts may be recognized by their structure, that is to say, as C. Ruge has shown, they are regularly lined with cylinder epithelium, and are better explained on the assumption that they are retention cysts of the glands, than in any other way.

Winckel's suggestion that these cysts result from obstruction of the mucous follicles of the vagina, or the belief that they are due to dilated lymph vessels (Klebs), cannot be excluded; the present results of examination, however, do not point to such conclusions.

More readily explainable are the cystic tumors which partially develop from the peri-vaginal connective tissue, and the contents of which are at times hemorrhagic, at times pale, watery or slimy. The first are the result of trauma—hematoma after a fall, after labor (Sanson, Winckel); the latter, as Verneuil has shown, result from the collection of serum in the loose cellular tissue between the rectum and vagina, the cause of which is relaxation of the vaginal wall from traction or pressure. When there is collection of much fluid, there is cystic projection toward the vagina, that is to say, a hygroma recto-vaginale.

Although the anatomical examination of cysts of the vagina prove that they are of varied origin, this is still more apparent from the clinical findings. Cystic tumors growing down towards the vagina from neighboring organs or tissue cannot sometimes be differentiated from those which arise from the vagina. Maünel has recorded an instance of such a tumor with atheromatous and dermoid-like contents; Paul has reported a peculiar case where a cystic tumor pushing down the posterior vaginal wall proved an obstacle to labor; and after the mucous membrane had yielded longitudinally, a black body, the size of a man's fist, projected, the contents of which was a black fluid in which were pale gray, shiny bodies the size of a bean. That he was not dealing, as in Sucro's case, with a tear in the posterior vaginal fornix, with prolapse of an ovarian cyst, is proved by the thinness of the walls of the tear in the vaginal covering of the tumor, and by the fact that the puerperium was undisturbed.

Although no anatomical examination was made, still this cyst of Paul's was probably an echinococcus-cyst. Latterly, Schatz, in a valuable paper on echinococci of the genitals and the pelvis in the female, has collected a number of such cysts, in part lying between the vagina and bladder (Hill, Eldridge), and in part between the rectum and vagina, in which number Paul's is included (Park, Blot, Paul, Schatz, Sibille). Possibly the crypts near the orifice of the urethra, which are occasionally long ducts, may be converted into retention cysts. Von Preusen has reported an instance where a gland of the urethra developed into a cyst the size of a walnut and was prominent in the vagina. Belfield noted the presence of considerable bending and flexion in the course of Morgagni's lacunæ of the posterior urethral wall, and considered this a favorable cause for the development of retention cysts in the female.

Possibly certain deep-seated cysts in the urethro-vaginal septum, which being sub-mucous, may attain considerable size, may originate from partial dilatation of the urethra (urethrocele). This possibility implies that the entrance into the diverticulum has narrowed and closed, and this has not been seen to occur. Still, I will relate an incompletely observed case which suggests this possibility to my mind, although it does not prove it. A specially strong woman, who had been married for four months, had had for two months a tumor hanging from the genitals which rendered walking difficult and caused dysuria. I saw her in November, 1875, and I found a slight prolapse of the anterior vaginal wall. The catheter entered the prolapse without difficulty, and the wall intervening between it and the finger in the vagina seemed very thin. I saw the patient again in April, 1876. The prolapse of the anterior vaginal wall still existed, but the catheter no longer entered it, passing over it into the bladder. There now existed a cystic sac, filled with pus, the size of a hen's egg, which was discharging into the vagina from an opening the size of a pin's head. I incised this opening to the extent of three-quarters of an inch, made a counter opening and passed a dráinage tube. Under injections of carbolic the sac shrank, and in three weeks it was cured. Such a sac as this might readily be mistaken for cystocele. Scanzoni has recorded two cases very similar to mine.

There is but little to be said in regard to etiology. Huguier's supposition that pregnancy and labor had an influence has been disproved by Winckel, seeing that of fifty cases which he collected, only eight had borne children. Their dependence on catarrh can scarcely be granted, although the presence of catarrh near these cysts is noted, and, owing to the slight symptoms caused by these cysts, the time of their development generally cannot be stated. The cases are few in number when an examination was made before their presence and then afterwards. Knowledge of the etiology is yielded in those cases where the cysts formed after traumatism, and generally then they follow on hemorrhage.

Only larger vaginal cysts cause symptoms by rolling down the vaginal walls into the lumen of the vagina, and outside of the genitals. They may then cause vaginal catarrh, bearing down, pain in walking and in sitting, dysuria, dyspareunia, and prove serious obstacles to labor. Hardwicke recorded an instance of impediment to delivery, and cited similar cases from Ashwell, Langley, Lever, Peters, Mundé.

Mundé's case is the only one of these which affected the anterior vaginal wall. Catarrh of the vagina is frequently found near the cysts. We have already referred to the possibility of a catarrh favoring the development of these cysts.

We need not say much in regard to diagnosis, since their fluctuation and their seat in the vaginal wall are sufficiently characteristic. Mistaking them for a cyst of the Bartholinian gland is hardly likely, owing to the site of the latter. Retention tumors in semi-atresia of the vagina are characterized by their longitudinal shape and their relation to the uterus; peri-vaginal hematomata and abscesses are suggested by the history, the great pain they cause, the infiltration of the borders, the irregular form, and when superficial by the color.

In treatment simple puncture will not suffice. In a few cases after puncture and cauterization with lunar caustic or iodine, cure resulted, but this method is uncertain. The preferable method is incision and cauterization, or through drainage. The best way of all is extirpation, and this has the advantage that we can suture the surface and obtain union by prima intentio, as in Hörder's case. Sometimes total extirpation fails, and then we must be content with partial (Lee, Mundé). Schroeder has lately advocated cutting off the projecting part of the cyst with the scissors, and sewing its edges to the mucous membrane of the vagina. The inner wall of the cyst, which according to Ruge is covered with cylindrical epithelium, soon cannot be distinguished from the rest of the vaginal mucous membrane.

B. FIBROMATA AND FIBRO-MYOMATA.

The results of close histological examination of the tumors belonging in this category have been stated in such a limited number of the cases, that a differentiation between the muscular and the pure connective-tissue forms for the purpose of classification of the reported cases is scarcely possible. With the exception of Paget, who has described an instance of a tumor consisting of pure connective tissue, recent authors have found, with great regularity, smooth muscular fibre in sessile vaginal fibromata, and have hence compared them with uterine fibromyomata (Virchow, Klebs). These tumors are rarely met with, and probably develop in the submucous tissue, or in the deeper layers of the mucosa. According to Virchow's observation they grow from without inwards, and so seldom towards the lumen of the vagina, that this most expert anatomist never met with a myomatous polyp of the vagina.

As these tumors increase in size they spread towards the vagina, become polypoid, and hang outside of the vulva (Scanzoni, Porro, Neugebauer, Lambl, Dufour, Demarquay's case), and therefore in this respect, also, they are analogous to uterine myomata. Kleinwächter is the most recent writer who has collected the cases reported in literature. In 1882 he collected fifty instances, to which number he afterwards added three further cases, two from preparations in the Prague anatomical collection, and the third a personal case. To these fifty-three cases I am able to add five others: A case of Hermann's, two reported by Gaye from A. Martin's practice, one from Caswell, and one personal unpublished case. The history of this patient is: Thirty-seven years of age, and one delivery fourteen years previously. She nursed her child for nine months. The patient complained of hæmoptysis, and there were signs of tuberculosis at the apices. She menstruated regularly and suffered from profuse leucorrhœa. The tumor in the vagina was the size of a small date, hard, and adherent, partially covered by movable mucous membrane, and occupying the anterior fornix. I extirpated the growth on June 29th, 1883, by cutting into its capsule and lifting it out of its bed. A profuse arterial hemorrhage was checked by ligation. The sac was sutured, and iodoform tampons inserted into the vagina. Microscopically the tumor proved to be a pure myoma.

These five additional cases were all examined microscopically. Caswell's case was a fibroma, Hermann's and Martin's were fibromyomata, and mine a myoma. In 39 of the cases collected by Kleinwächter, the seat of the tumor was noted, and adding these to the five additional cases, of the 44 the tumor was on the anterior vaginal wall in 28, in 11 on the posterior, and in 5 on the lateral wall. In general the upper vaginal segment was implicated by the growth.

In many instances these tumors attain great size, in a number of cases over 2½ pounds, and in two of the older cases (Baudier and Gremler) over 10 pounds. In the frequent polypoid form, the pedicle was usually thick, and but rarely thin (Scanzoni). Large polypoid fibromata, which remain in the vagina only because of narrowness of the canal, are generally expelled under energetic muscular pressure of the abdominal walls (Trätzl, W. Greene); in the majority of cases the expulsion is gradual. The growth of these vaginal tumors is a slow one, and in Neugebauer's case the patient had borne the tumor for twenty-two years.

In regard to the influence of menstruation and pregnancy on fibrous tumors of the vagina, nothing definite can be stated. Softening and serous infiltration, the result of interference with the circulation, and occasional ulceration of the surface, have been frequently noted, aside from menstruation or pregnancy. (Paget, Höning, Chadwick.)

As regards age, the majority of the patients were in the years of greatest sexual activity. The oldest patient (Greene's) was fifty-one years old and had known of the tumor for fourteen years. Three instances of fibromatous polyps in small children have been recorded. (Trätzl, Wilson, A. Martin.)

In a fifteen months' old child, who had been unable to either micturate or defecate for a day and a half, Trätzl found a soft, elastic, grayish-blue tumor impacted in the introitus vaginæ and compressing the urethra and the rectum. The bladder was greatly distended, the external genitals hot, reddened, and œdematous. By careful traction he pulled the tumor downwards and a small amount of urine was passed spontaneously. Attempts to deliver the growth were not successful. On the following morning the tumor had been spontaneously expelled. It was the size of a man's fist, shaped like a pear, and the pedicle was as thick as the little finger. Its surface was bluish-red, smooth and shiny in part, and in part furrowed. It was very vascular. Trätzl ligated the pedicle and on the sixth day the tumor dropped off. It was fibrous in structure. The child convalesced well.

I have been unable to find Wilson's description of a large vaginal polyp in a child two and a half years old.

A. Martin has latterly recorded the third instance. The child was two days old, and at full term. The midwife had noticed at once a bright red growth the size of a lentil projecting from the vagina. Martin found it surrounded by the rima pudendi, its surface reddened, and pulled it out with a dressing forceps. It was about ¾ of an inch long, with slender pedicle inserted above the hymen, to the left of the mid-line at the level of a fold of the posterior columna rugarum. The pedicle was ligated as near its base as possible, and the polyp cut off. There was no hemorrhage, and on the third day the ligature dropped. The child's general condition was not affected. The polyp was very hard to the touch, was covered with squamous epithelium and with papillæ arranged like those of the vagina. Glands were not discovered, but in the centre were numerous large blood-vessels, imbedded in firm, connective tissue. Muscular fibres were not detected.

The symptoms depend on the size, the early or late expulsion of the tumor, and on the complications. Usually, when small, fibromata of the vagina are not recognized. Gradually they lead to catarrhal secretion, cause dragging sensations, and as they increase in size, they produce dysuria, and finally retention of urine. Tumors which project from the genitals, are not alone troublesome by the traction they exert, but they are subject to the same irritant causes as prolapsus. They become swollen from venous stasis, and painful from ulceration and erosion of the surface.

Van Doeveren found a polyp weighing one and a half pounds inserted on the anterior vaginal wall, and obstructing labor in a primipara. He was able by manual traction to push the tumor out of the way of the fœtal head. According to their seat and size, these tumors are likely to interfere with cohabitation, and in case of conception to interfere with the progress of labor. In a case operated upon by Pelletan, the physician was able to pull down the partially expelled tumor, and the fœtus was born spontaneously. In Gentrul's case the fœtus was delivered by the forceps, the tumor tearing away from its upper vaginal attachment at the same time. The most unfavorable result was in the case the specimen of which is in the Berlin pathological collection, and has been described by Virchow. An oval myoma, the size of two fists, was situated in the posterior vaginal fornix, and proved an obstacle to labor. In the attempt at delivery of the fœtus, the vagina was ruptured and the pubic bone fractured. The woman died in four weeks from necrosis and suppuration of these parts. In other reported cases the fibroma did not prove an obstacle to delivery. In McClintock's thirty-nine year old patient, where, with Johnston's assistance, a fibroma two and a half inches long and of the same breadth, seated on the anterior wall, was removed by a ligature, delivery took place without difficulty. Neugebauer's patient was delivered a number of times, notwithstanding the presence of a tumor. In Porro's case the tumor was driven by the pains in front of the fœtal head, delivery was spontaneous, and after enucleation of the tumor the woman passed through a normal puerperium. A few cases have been noted during pregnancy, and in three the fibroma was extirpated, and in Gremler's case it weighed over ten pounds. In McClintock's case, the pregnancy was not interrupted, as also in Gremler's, and the women were, happily, confined at term. Another case of McClintock's was not so fortunate. Before operation the tumor had begun to break down, and had begun to project back into the vagina. Twenty days after its removal by the écraseur, the woman was delivered of twins, and died of exhaustion in twenty-four hours. At the autopsy septic endometritis was found.

The diagnosis is readily made, seeing that the uniformly round, isolated, or pediculated form, with surface covered with smooth mucous membrane, and elastic to the touch, is characteristic. The surface may be lobulated, or narrowed by constriction at the orifice of the vagina, or there may be changes in consistency, the result of ulceration. Important diagnostic points are the slow growth and purely mechanical disturbance. These growths may be simulated by faintly fluctuating cysts with thick contents, and with other tumors of slow growth, and the latter particularly cannot always be differentiated before extirpation. Demarquay satisfied himself that he was not dealing with a cyst by resort to the exploratory puncture, and this device also assisted Pelletan. In the living it will often be impossible, before operation, to differentiate from many forms of sarcoma.

The treatment consists in extirpation either by the ligature, excision, or enucleation. The ligature, even as in case of uterine myoma, best guards against hemorrhage, although it has not always so answered. In the case which McClintock treated with Johnston there occurred profuse hemorrhage on the fifth day following on necrosis and ulceration. On the eleventh day the ligature was removed, and thereafter the tumor was gradually taken off piecemeal, and only after three weeks did the growth entirely disappear. Although this case eventuated happily, it clearly proves the danger of the method. It belongs to the year 1845. Ecrasement and the galvano-cautery, although they have the advantage of rapidly removing the tumor, carry with them no immunity against hemorrhage, and this is well illustrated by the two operations of Neugebauer on one and the same patient. The heated wire does not slip, like the cold, under the circumference of the round tumor, but cuts the more certainly at the locality where it is placed the more carefully the cautery is worked. A portion of the tumor may remain, which will slowly grow and necessitate a second operation. It seems to me that the ligature should be of special value in case of great vascularization of these tumors, although I have not tested it in case of fibromata of the vagina. Especially do I think this is true, since, by guarding against hemorrhage, we also guard against slow necrosis of a large tumor. Where the fibroma has not a very broad base it may well be ligated in two portions; or else in case of pediculated fibromata, a wire ligature might be thrown around the pedicle and left there, the greater portion of the tumor being excised. Simple excision of pediculated tumors by means of the scissors has often been performed, and there has not always been much hemorrhage. Twice it had to be checked by iron tampons, and also in the slender pediculated myomatous polyp of Scanzoni. Simple excision is not so favorable as in case of uterine myomata, since these growths in the vagina do not lie in an organ which will contract after their removal, and thus aid in limiting the risk of hemorrhage. In case of vaginal myomata with fibrous pedicles, the ligature is to be recommended. In case of round, broad-based fibromyomata, which are fairly movable, enucleation, after cutting the mucous membrane next to the tumor, even as Dupuytren did, is, without question, the best method, especially since sutures may be more readily inserted. In case of small, long tumors, longitudinal incision into the capsule is preferable. If possible sutures should also be inserted here, since thereby there is greater chance of union by first intention. Where the cavity left after enucleation is large, much may be accomplished by means of compression with iodoform gauze and the wearing of a T-bandage.

C. STRIOCELLULAR MYOMA.—RHABDOMYOMA MYXOMATODES.

There exists only a single observation of this form of tumor. It was removed from a strongly built girl of fifteen, who had not as yet menstruated, who came to Seyfert's clinic at Prague in 1869 for the relief of difficult micturition. On examination a polypoid tumor with rather large pedicle was found on the anterior vaginal wall, which was removed and the patient was discharged in ten days, the wound having healed. In six weeks she returned, since the tumor had grown again. She then consulted Fr. Kaschewarowa. The maiden was in the full bloom of youth. The external genitals were not entirely developed, there was no hair on the pubes, but otherwise they were normal, and the uterus was sound and in good position. On the anterior vaginal wall there was a tumor the size of a hen's egg, with fairly broad pedicle, lobular surface, and of reddish color. The substance of the tumor was so soft that portions could be removed with the finger, and this was painful. With the naked eye a superficial layer could be seen on the removed portions (mucous membrane), and below it the loose tissue tumor. The latter had the color and consistency of soft wax, and it contained a large amount of blood. Neither by pressure upon, nor scraping a recent section with the knife, could turbid juice be obtained, but only a clear fluid, on great pressure, in which were particles of the tumor. During the patient's stay in the clinic the tumor increased in size. From time to time Seyfert removed small portions, and the end of May a piece the size of a hen's egg, which Fr. Kaschewarowa examined. The tumor turned out to be a rhabdomyoma (Zenker), combined with myxomatous tissue. After the removal of a large portion, the patient was attacked with pelvic peritonitis. The growth necrosed in places, and then increased quickly in size until by the end of June it had attained the size of a child's head. The patient's strength failed, she suffered constant pain in the lower part of the abdomen, and she died on the twentieth of July. At the autopsy the lungs were found tubercular. As to whether a lentil-sized adherent nodule which was found in a calix of the kidney was a metastatic growth, or not, the history does not state. The specimen is in the Prague anatomical collection (No. 2069) and has been examined and described by Klebs. In the right half of the anterior vaginal wall behind the orifice of the urethra there was found a nodular, broad-based tumor, the size of a fist, which extended about three-quarters of an inch towards the vaginal vault. It was broadest in front and diminished in size backwards. The posterior and left walls of the vagina were free. The mucous membrane spread over the tumor, and the surface was generally smooth. At the lower extremity, which projected a trifle from the vagina, there was a funnel-shaped cavity. On cross section, the surface was smooth and fibrous. The growth extended into the perivaginal cellular tissue to the right and posteriorly. The uterus was small, body and cervix unchanged, the cavity one and a half inches deep. The adnexa were generally adherent, and Douglas's fossa contracted. The right tube and ovary could be freed from the adhesions, and were unchanged. The left tube was dilated, the left ovary unrecognizable. The bladder was healthy, the urethra was slightly pushed to the left by the growth. Kaschewarowa found in the examined sections all the developmental forms of striated muscular fibre. The muscular elements were arranged here and there parallel one to another, and bound together in a species of bundle; in other places they were intermingled with myxomatous tissue. The surface of the growth was covered with flat epithelium. The mucous membrane contained neither papillæ nor characteristic cellular tissue or muscular elements, but these elements were scattered throughout the layer of the tumor under the epithelial stratum. Kaschewarowa concluded, hence, that the tumor had probably had its origin from the mucous membrane. Klebs, seeing that he was able to follow the young muscular fibres of the paravaginal tumor into those which belonged to the levator ani, concluded with a greater show of reason that there existed rather a hyperplasia of normal muscular tissue. Thence there arose growth of the interstitial and muscular elements, some becoming myxomatous, others of striated muscular fibres deprived of the sarcolemma, while the more recent intravaginal portions contained only spindle cells. The striated young spindle-form muscular cells, detected by Kaschewarowa and also by Treitz and Eppinger, in sections from the fresh preparation, were not found by Klebs in the alcoholic specimen. Neither can I find them in the sections kindly furnished me by Eppinger. I find, however, young striated cylinders next to the muscular bundles, as is shown in the illustration.

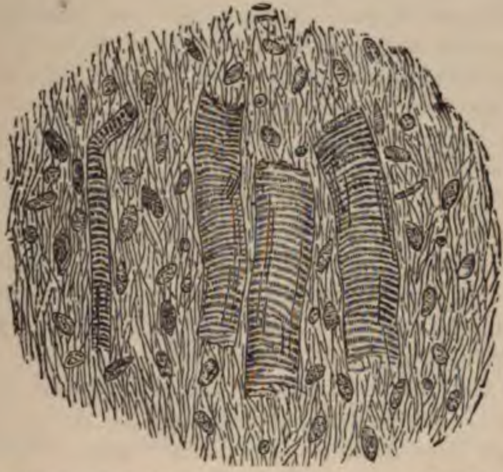

FIG. 32.—MYXOMATOUS RHABDOMYOMA OF THE VAGINA. (Hartnack, 3, viii.)

In the diagnosis of vaginal tumors this peculiar arrangement must be remembered, and on account of their rapid growth they suggest the possibility of the existence of the malignant soft sarcoma. Indeed, in a case of Hauser's, of primary sarcoma of the vagina in a two year old child, the same long striated spindle-cells were found, passing into young striated muscular fibres. In such instances complete extirpation down to the base of the growth is indicated, and as to whether the knife, scissors, ligature, or galvano-cautery is preferable will depend on the peculiarities of the individual case.

D. Papillary Tumors.

In addition to the not uncommon condylomata which are found in the vagina, generally as the result of a virulent catarrh, and which, particularly in the gravid, often develop greatly, there are a few cases recorded of diffuse papillomatous degeneration of the vaginal mucous membrane. The papillary excrescences described by Klob are not properly tumors, but simple hyperplasia of the papillæ in the neighorhood of ulcers, analogous to the enlargement of the villi around ulcers of the intestine. Although in these formations we are dealing with simple lengthening of papillæ on inflamed surfaces, Müllerklein, Marsh, and Crook have described characteristic forms of new growths, the histological formation of which has not been definitely stated. They are, however, differentiated by their clinical phenomena. Müllerklein's case concerned a woman of thirty-eight, greatly weakened from protracted leucorrhœa and metrorrhagia. Müllerklein found on the upper portion of the posterior vaginal wall, a cauliflower-like tumor, the size of a hen's egg, with a pedicle an inch thick. He extirpated it with the scissors, and it had not recurred at the end of a year. Anatomically it was found to be a characteristic cauliflower growth. Marsh saw a two year old child, in whom for a long time many formed and colored new growths had projected from the vulva and the urethra, and had constantly recurred after extirpation. The child died speedily from exhaustion. The growths consisted in "a polypoid swelling of the mucous membrane of the bladder and the vagina, with fibrous base, in part smooth, in part covered with epithelium, and generally very vascular." Sänger has since stated that Marsh's case had again been carefully examined, and that Beck's report pronounced the specimen to be hyperplasia of the cellular tissue in the vesico-vaginal septum associated with hyperplasia of the mucous membrane. In no part of the specimen was tissue found which did not correspond to simple hyperplastic swelling of the normal tissue.

In Billroth's case, which is only briefly reported, the child, aged eighteen months, had suffered for two months from bloody purulent discharge from the vagina, and the vagina was filled with soft, pediculated, polypoid vegetations, which could not be determined as sarcomatous.

Although, therefore, we are not justified in classing these cases under sarcoma, still the clinical course suggests their analogy with genuine sarcoma. The development is similarly rapid, the course malignant, the site the same on the vesico-vaginal septum where the infiltration is most marked, and here also there exist polypoid growths of the mucous membrane towards the vagina and to a less degree towards the bladder. It seems as though in the histological formation of these growths this locality is favored, and that occasionally a fibroma results, and then a sarcoma. In Hauser's case there was simultaneous development of sarcomatous, myxomatous, and rhabdomyomatous elements. In regard to Müllerklein's case, we have no exact anatomical explanation, and the possibility exists that it may have been carcinoma or sarcoma, although there had been no recurrence at the end of one year. I have not been able to see the history of Crook's case.

E. PARTIAL HYPERPLASIA. (POLYPI.)

Under this name we include the rare cases which are recorded indifferently as polypi or pediculated fibromata. Kiwisch refers to them as the most frequent variety of polyp forms, and describes them as ordinary mucous tumors, analogous to the glandular polyps of other mucous surfaces. He seems to have met with them frequently, since he states that in the majority of his observations they were the size of a hen's egg. According to Kiwisch they may spring from any portion of the vagina, although the posterior wall is the most common site. Generally they have a thin pedicle or they are club-shaped, and the texture is the same as that of other mucous polypi. They cause symptoms only when they attain considerable size and work their way into the vestibule. In a case of labor Kiwisch witnessed such traction on a polyp the size of a hen's egg, that it became inflamed and degenerated in part. I am familiar with only a single case, which was shown me by Eppinger in the Prague collection. It is a broad-based, conical polyp, three-quarters of an inch long, and about as thick as the little finger at its base. The surface is smooth and covered by the epithelial layer. In texture it consists of simple hyperplasia of the submucous tissue and ectatic lymph vessels. I can find no recorded instance of the pediculated club-shaped growths which Kiwisch describes. As analogous to them I can simply mention the string-like or tongue-like projections which are occasionally found on the borders of the hymen in new-born fœtuses, which may attain quite a size. I recently removed such a mucous, string-like projection, about two and a half inches long, and the thickness of stout twine. It turned out to be a simple enlarged papilla, in the connective tissue of which were ectatic vessels.

A positive diagnosis of partial hyperplasia of the mucous membrane may be reached by the presence of a slowly developed, broad-based, polypoid, soft tumor, of normal mucous membrane color, which differentiates it from the various growths of the vaginal mucosa.

The treatment consists in excision.

F. LIPOMA.

Pelletan has described lipoma in the recto-vaginal septum, spreading towards the lumen of the vagina, but he gives us no histological data. Still I will record the following unique cases: In a woman forty years old, there had grown for three years a tumor in the recto-vaginal septum, which projected from the patent vulvar cleft, was cylindrical in shape and was eight inches in length. By rectal examination it appeared globular. It was perfectly movable, and its mucous covering, which was ulcerated at its upper portion, could be slid over it. The growth was not at all painful even on pressure, but the patient suffered from leucorrhœa and menorrhagia, which had greatly weakened her. Pelletan incised the capsule longitudinally, and enucleated the growth partially with the finger, and partially with the handle of a scalpel. He packed the cavity, which bled profusely, with charpie, and removed it on the fifth day. The patient recovered well, and the menses became regular. Pelletan pronounced the tumor a lipoma. In a similar manner he removed a lipoma from a young girl of seventeen or eighteen years of age. The tumor had existed for two years and caused a profuse foul discharge. It lay between the vagina and the rectum, was globular, the size of a fist, and the surface was ulcerated. This tumor was also movable as well as the mucosa covering it; it was not at all painful, even on pressure.

G. SARCOMA.

The recognition of this variety of new growth in the vagina belongs to very recent times. It appears in the form of a circumscribed round tumor in the sub-mucous tissue, and also as a diffuse superficial degeneration of the vaginal walls. Without question instances of the first sort may, without close histological examination, be ranked with fibromyomata, and those of the second sort with carcinomata. Further, primary sarcoma of the vagina, as is proved by Sänger's case, may develop, in a similar manner to the rare forms of papillary sarcoma of the cervix (Spiegelberg, Winckler,) into polypoid papillary excrescences. It is interesting to note at what an early age this growth has appeared in the few recorded cases, and also that in a single case (Demme's) it is stated that at birth a tumor the size of a pea was found between the labia. In case Babes's instance of primary endothelial sarcoma, (a movable, walnut-sized, readily enucleated tumor, which returned after three years as a spindle-celled sarcoma), which existed in the introitus vaginæ, be classed here, then I find six instances of sarcoma of the vagina in small children, as certified by microscopic examination. In Hauser's case the age was two years; in Soltmann's two and a half years; in Sänger's and Babes's three years respectively; in Ahlfeld's three and a half years; in Demme's five and a half years. Of the instances observed in adults, the youngest patient was seventeen (Kaschewarowa), the oldest fifty-eight (Spiegelberg.)

The anterior vaginal wall was entirely or largely the seat of the growth in six instances (four times in children), and in the histories to which I have had access the posterior vaginal was affected twice, the right lateral wall once, and the entire circumference of the vagina once. Ordinarily, and five times in children, the first sign was the appearance between the labia, without subjective symptom, of a small polypoid tumor. In the adult the symptoms appear to have been slight until the tumor began to grow rapidly and to partially break down. When the growth was accompanied by increased secretion, atypical hemorrhages, dysuria, bearing down sensations, then it had attained considerable development. When suppuration and extension to the neighboring organs had occurred, then the symptoms were dependent on the local changes, and in children, especially, the pressure symptoms on the pelvic organs were very marked.

Although in many instances the growth of this tumor extended over a number of years, especially the fibro-sarcomatous form, yet in the majority of cases the malignancy of vaginal sarcoma was most apparent. In every case, except Spiegelberg's, the growth recurred with great rapidity after extirpation (in Demme's case, where the record states that there was as yet no recurrence, this was written a short time after extirpation). Although the quick recurrence in many instances may have been due to imperfect extirpation, yet there is not a single case on record where recurrence did not set in, and this is characteristic of this variety of tumor.

Owing to the variety of these tumors we will record a number of instances.

Kaschewarowa reports two cases. The one concerns a strong multipara, in whom two years previously there had appeared a small tumor on the posterior vaginal wall near the fornix, which slowly increased in size, resisting all local measures, and which was as large as a gulden and was ulcerated on the surface. Professor Kieter extirpated it, and it proved to be a spindle-celled sarcoma lying in the mucous membrane and extending scarcely at all in the submucosa. Recurrence speedily set in. Kieter's second case, of a similar nature, was seen in the Moscow *Marien* hospital, and concerned a maiden of seventeen. On the posterior vaginal wall was a soft, easily torn, tumor, the size of a goose-egg, and in four months after extirpation it had recurred and was the size of a fist. The very anæmic patient died shortly after the second operation.

In Spiegelberg's first case a circumscribed fibro-sarcoma of the lower portion of the anterior vaginal wall, the size of a walnut, was extirpated, and pronounced by Waldeyer to be a spindle-celled sarcoma. The patient convalesced well, although she was in poor condition at the time of operation, and four years afterwards there was no recurrence. The patient had borne four children, the last time four years previously.

Spiegelberg's second case concerned a woman of fifty-eight, who had been married twenty-two years, was sterile, and had reached the menopause at forty. At fifty-seven she began to suffer from hemorrhage, which gradually became more profuse. The patient was anæmic but well-nourished, and just within the introitus vaginæ the mucous membrane was irregularly infiltrated, and bled readily. The condition suggested a superficial ulceration, epitheliomatous infiltration, nodular in places. The uterus was atrophied but healthy, the pelvic organs were not infiltrated, the inguinal glands not enlarged, the abdominal and thoracic organs were sound. Excision was accompanied by profuse hemorrhage. Convalescence was retarded by diffuse abscess of the inner surface of the left thigh, by lymphadenitis inguinalis of the same side, and by diphtheria of the wound. A deep abscess in the groin was repeatedly opened, but the drain on the patient's strength was too excessive, and she died in a few weeks. Waldeyer examined the growth and reported that it had the character of a small-celled medullary sarcoma.

Bajardi's patient was twenty-five years old, of healthy parentage, and had menstruated regularly from her sixteenth year up to marriage. At the fifth to sixth month of her first pregnancy, she began to have the sensation of a foreign body in the vagina, and suffered from pain when she attended to her work, that of weaving, for a number of hours. Towards the end of the eighth month her suffering was so great that she entered the hospital. Raccaqui and Colombo found a tumor, the size of a hen's egg, projecting from the vagina, and growing by a pedicle the size of the thumb from the posterior vaginal wall. On the pedicle was a lobule the size of a bean. There existed in addition a smaller isolated tumor to the left of the middle of the posterior vaginal wall. The large tumor, since from its size it would prove an obstacle to delivery, was removed by the galvano-cautery, leaving its base behind. Microscopically it proved to be a round-celled sarcoma. After two months, the patient having in the meantime been delivered, the pains recurred, and one month later she was seen by Bajardi. He found two tumors in the posterior vaginal wall, broad-based, the larger the size of a hen's egg, of varying consistency. Examination caused neither pain nor hemorrhage, the inguinal and pelvic glands were normal. The tumors were not ulcerated. They were extirpated by the galvano-cautery. No hemorrhage. Before being discharged the growth slowly recurred, the glands throughout the body becoming affected, and metastases were present in the skin and the mammæ. The patient died in eight months of peritonitis. There was no autopsy. Microscopic examination of the larger tumor proved it to be a round-celled sarcoma, of the smaller a spindle-celled.

Of the instances seen in children, Sänger and Hauser have recorded histories of uncommon interest.

Sänger's Case.—A three year old child was brought to the Leipsic clinic the 16th of August, 1879. The mother stated that the child had been well up to four months previously. It had then begun to lose flesh, and to complain of painful micturition and defecation, the bowels acting only at intervals of two days. It had a profuse foul vaginal discharge, and occasionally a tumor the size of half a finger appeared at the introitus vaginæ. On one occasion a body the size of a small apple had been expelled with hemorrhage of three days' duration. Attempt had been made to rape the child about five months previously, from which date the mother dated its complaint. From the vulva hung two bodies like mucus polypi, pediculated from the posterior hymeneal border. On bearing down there appeared at the introitus a still larger tumor, with ulcerated surface, distending the vagina and sessile on the anterior wall. There existed in addition a number of polypoid excrescences, like hydatids, occupying various portions of the mucous membrane and readily separable. These masses were curetted away with but slight hemorrhage. A few weeks afterwards examination under anæsthesia revealed a number of the same polypoid excrescences. The broad ligaments were thickened, and dense masses occupied the recto-vaginal septum. The curette was used again. Microscopically the masses proved to be typical round-celled sarcoma. The child died in four months after Sänger first saw her.

Hauser's Case.—The child was of healthy parentage. At the age of six months, on crying or bearing down, a tumor the size of a bean would appear at the vulva; at the ninth month it had attained the size of a walnut, and it remained external, where it soon ulcerated and caused great pain. In April, 1880, it was removed by the family attendant; in five months it had recurred; in October, 1880, it was again extirpated and recurred in four months, and grew rapidly. In January, 1881, the child was taken to the Erlangen clinic, and the tumor was the size of a medium-sized pear. The child's general condition was good. Zweifel removed as much as he could without injuring the bladder, and chloride of zinc was applied to its base. On the sixth day there was recurrence. The curette was used and the little one discharged on the 22d of January, 1881. In April she returned to the clinic, and the tumor was the size of a walnut and ulcerated. It was easily removed without hemorrhage. The vagina was enormously distended with soft papillary excrescences, which were readily removed. The patient was discharged in six days, but in May Hauser again noted recurrence. The case was then lost sight of. Microscopic examination proved it to be a round and spindle-celled sarcoma.

The diagnosis can only be made by the microscope. The prognosis, hence, cannot be stated before extirpation. The myoma-like forms are more favorable, since they can be entirely removed, than the flat, diffuse forms, as is proved by Spiegelberg's case, where there was no recurrence at the end of four years.

As regards the treatment, the same measures are indicated for the round tumors as is applicable to fibromata, and for the flat, diffuse, the same as in carcinomata.

H. Cancroid and Carcinoma.

These growths are also rarely primary in the vagina, but quite frequently secondary, in particular by extension of carcinoma from the uterus to the fornix vaginæ, and next from that of the rectum, vulva, urethra, less frequently from the bladder, and further as metastases from distant carcinomatous foci. Küster has given us the latest collection of cases of primary carcinoma of the vagina, and after the exclusion of a number of cases which seemed doubtful to him, he has obtained twenty-two instances, to which number Olshausen has added two. Primary carcinoma of the vagina is met with in two forms: the first and most frequent is the papillary cancroid, and the second is the carcinomatous infiltration. The first is generally seen as a circumscribed broad-based excrescence, generally on the posterior vaginal wall, and the second as a substitution for the normal tissue of medullary or schirrous masses. Of nine instances of this variety (without differentiating the carcinoma form), in four the entire length of the vagina was affected. The posterior wall was affected nine times, the left posterior once, the right once, both lateral walls once, the anterior wall twice.

In regard to etiology the reported cases give us meagre information. The same rule holds as regards age as in carcinoma of the uterus. The majority of the cases occurred between thirty-one and forty years of age, nine cases; four cases occurred between forty and sixty years. Exceptionally the disease occurs at an earlier age. Küster records two cases from fifteen to twenty, and two from twenty to thirty. In the Strassburg pathological museum there are four specimens of primary carcinoma of the vagina, and one is a broad-based glandular carcinoma, which was removed from the posterior fornix vaginæ of a nine year old child. In a single case reported by Hegar, traumatism was the etiological factor, and he removed two cancroidal nodules in a woman fifty years old, caused by the pressure of a closed Hodge pessary against the ascending ramus of the pubes.

All forms of carcinoma vaginæ lead to rapid destructive ulceration, with peripheral and deep extension into the neighboring tissues. As the growth breaks down there results an elevated cancerous ulcer which may eat its way into the adjoining organs, and owing to the frequent seat on the posterior vaginal wall, a recto-vaginal fistula is often established. Extension by the lymphatics into the glands of the pelvic cellular tissue occurs, as also into the inguinal glands in case of the deep-seated form. The usual symptoms are hemorrhage, suppuration and pain; occasionally there are mechanical symptoms, during cohabitation and delivery, the result of stenosis and obstruction of the lumen of the vagina; further there are symptoms from the side of the adherent neighboring organs. The most important and never-failing symptoms are the anomalies in secretion, the watery, bloody, and purulent discharges. These depend partially on the form and the vascularization of the carcinoma, partially on the stage of the growth. Coitus and other mechanical insult, such as distension of the recto-vaginal septum by constipation, are causes of hemorrhage, as is proved by the recorded histories. Bodwin's case of "erectile cancroid" is an instance of unusual vascularization. It concerns a woman of thirty-one, whose father and grandfather had died of cancer, and who was suddenly seized with profuse hemorrhage from the genitals. Bodwin found a vascular tumor the size of a walnut, on the anterior vaginal wall near the urethra, from the centre of which an artery the size of a needle spouted. The hemorrhage was checked by the local use of a solution of sesquichloride of iron, tampons, and rest in bed. In a few days it recurred. On the seventh day the tumor was ligated, it fell off in a few days, and left an apparently healthy granulating surface. Soon a foul dark discharge set in, and after fourteen days a large cauliflower-like growth was present. The hemorrhage did not recur, but the discharge became more profuse and foul, depreciated the woman's strength, and she died six weeks after the first hemorrhage. At autopsy a number of large, soft, carcinomatous masses were found on the posterior vaginal wall, distending the vagina; the rest of the mucous membrane was injected and thickened. The organs so far as they were examined, were normal. As a general thing, the discharges, the suppuration, and the inflammatory and septic complications only lead to death after wide extension of the disease.

Complication with pregnancy has been noted once. Bailly saw a gravida with a voluminous, lobulated carcinoma of the recto-vaginal septum, which had developed in the fifth month of pregnancy, and proved an obstacle to delivery. In the last three months of this pregnancy, the patient began to have a watery, at times reddish discharge, which during the fourteen days preceding delivery became profuse, and since it had no odor it was considered to be liquor amnii. The patient had only suffered pain during coitus, after which act she had ordinarily lost a small quantity of blood. During the second stage of labor the posterior vaginal wall together with the tumor was driven down to the vulva by the advancing head, and they retreated during the intervals. The tumor was neither torn nor did it bleed, although the child was removed artificially. The puerperium was normal. A month later the patient was very thin and anæmic, any exertion causing hemorrhage, and in the intervals there was a constant serous discharge. The speculum was carefully introduced, and the surface of the tumor was seen to be warty and white; it occupied the entire posterior vaginal wall. The tumor was much softer than at the time of delivery. On touch by the finger or instruments, there resulted hemorrhage, and pain, with faintness. Five months after delivery the woman died of exhaustion. Küster has recorded an instance of induction of labor by means of an elastic catheter in case of extensive carcinomatous infiltration of the vagina in a woman of twenty-four, who had previously miscarried three times. During the third pregnancy she began to suffer from profuse leucorrhœa, and since the third puerperium, she had almost constant hemorrhages, and in the interval watery discharges. During the fourth pregnancy, she bled almost continuously. The vaginal walls were covered with a large number of elevations and depressions, the lower inch of the canal alone being normal, smooth and soft. The external os was smooth and intact, and the cervix as well, although the canal was patulous. To the right and posteriorly the cervix was roughened. The masses were curetted, and the vagina irrigated with carbolic acid. Labor was induced eight days thereafter, delivery occurring in two days. During labor the patient was feverish and complained of pain to the right of the uterus. Seven days after delivery she died of septic pyemia. A crescentic ulcer, 3¾ inches in diameter, was found in the vagina, with hard walls. The base of the ulcer was uneven, torn, covered with a yellowish-green deposit. It extended down to the muscularis. It began a finger's breadth above the introitus and extended on to the cervix, more to the left than to the right. On the anterior wall the mucous membrane was not implicated longitudinally for about ¾ of an inch. In the diagnosis of carcinoma of the vagina, the well-known broad-based, nodular, immovable tumors are characteristic. They readily bleed on touch, and the serous or purulent discharges are always present. Papillary cancroids may appear as marked cauliflower-like excrescences, with great tendency to hemorrhage, and readily breaking down, and even microscopically they may thus be differentiated from large simple papillary hypertrophies. It is important to determine as to whether the growth is primary or secondary. It is necessary to carefully examine the neighboring organs, in particular those of predilection. Only where the cervix is not implicated, or else only externally near the vaginal growth, only where the rectum and the vulva, the bladder and urethra, are free, and no traces are found in other organs whence metastasis might take place, can we assert that the growth is primary in the vagina. Differentiation from sarcoma is to be made by the microscope. The cancroid and papillary forms generally extend from neighboring organs, the flat and stratified are usually primary, while the infiltrated nodules are most frequently metastatic from distant organs, such as the stomach.

The nugatory results from the treatment of carcinoma when primary in the vagina depend on the difficulty of removing the growth in its entirety. Curetting with the sharp spoon, removal by the galvano-cautery and ligature, cauterization by various agents, and the hot iron, extirpation with the knife, these have all been tried without result. Nevertheless attempts should ever be made at extirpation. Where the tumor is still circumscribed in extent and in depth, so that its removal with the fe or scissors is possible, the procedure is to be recommended not only on account of the certainty of being able to work in non-infiltrated tissue, but also on account of the possibility of checking the hemorrhage by ligature or suture, since the movability of the vaginal walls allows of the approximation of quite large wounds by means of suture. According to Hegar and Kaltenbach we should not abstain from operation for fear of injuring the bladder or the rectum, for any incision into them, after the removal of diseased portions, may be closed by suture. Schroeder has recently performed the most radical operation in such cases. He operated in three cases of carcinoma of the posterior wall, where the disease reached the fornix. He first incised superficially the vaginal mucous membrane from the entire tumor. At the upper border he prolonged the incision through the entire thickness of the mucous membrane, and loosened the carcinoma from above downwards. In one of these cases the peritoneum in Douglas's fossa was torn, and brought together by suture. In the first two operations he simply united the edges of the mucous membrane crosswise, and this left a depression in the posterior fornix, where the secretions collected, and this led to suppuration. In the last case he included the rectal wall by sutures which did not extend through it, and then fixed a drain tube in the posterior fornix. The first patient died of sepsis from suppuration of the wound; the second recovered and two and a half months thereafter there was no recurrence; the third patient recovered from the operation, but it is too early to make any statement in regard to ultimate result.

It is very exceptionally, however, that cases suitable for operation are met with, and ordinarily our operative aim can only be palliative in order to control for awhile the hemorrhage and the suppuration, and this is done by the measures we have spoken of. The more deeply we are able to cauterize, the longer in duration the result. Exceptionally, however, this may cause profuse hemorrhage, as is proved by the following case recorded by Grünewaldt: In a woman of thirty-two the cervix was amputated for carcinoma, and six months thereafter there was recurrence on the posterior vaginal wall which included the cicatrix left by the previous operation. In the attempt at removal of this recurrent growth, by the galvano-cautery, a profuse parenchymatous hemorrhage occurred, which resisted treatment, the patient dying in about six minutes. At the autopsy it was found that the anterior branch of the hypogastric artery had been cut through in the incision. Spiegelberg records an instance of sarcoma, where an analogous operation was performed, and where abscess occurred which quickly led to the death of the patient.

CHAPTER IX.

FOREIGN BODIES IN THE VAGINA.

FOREIGN bodies of most varying nature have been found in the vagina. Aside from pessaries, which, in addition to their curative properties, are able to inflict great damage, and aside also from tampons, many articles, such as pomade boxes (Dupuytren, Schroeder), pepper boxes (Mavel), spools (Pearse, Hoffmann, Carter, Breisky), needle cases (Förster), hairpins (Getchell), purses (Förster), lead pencils (Jobert), etc., have often been extracted from the vagina. Worms and insects, and we are not speaking now of parasites, have also been found. Voigtel found ascarides, which had crept from the anus into the vagina, as the cause of a persistent discharge; Cockson has reported a similar instance; Waldenström found the lumbricus communis in the vagina.

The foreign body usually gets into the vagina by the introitus, and only very exceptionally by perforation from the bladder or rectum. At times manipulation with fragile instruments results in retention of a foreign body; Kurz extracted the upper extremity of a glass speculum, which was imbedded in granulations; Day a broken remnant of a glass syringe which had been used for injections. Ascarides, as we have stated, proceed from the anus; and as for the common worm we should remember, as Meissner has stated, that certain women will introduce them.

In children foreign bodies may be inserted during play, as Meissner detected in a two year old girl, and at times articles, such as purses, may be concealed in the vagina. In the majority of instances, the foreign bodies are unquestionably inserted during masturbation, and, slipping from the fingers, they are carried deeper into the canal by its contractions. Where small objects are inserted into the canal, they may be sucked in deeply in the presence of negative intra-abdominal pressure. Of the instances of foreign bodies in the vagina, which I have noted, I will record two here, one in particular being of special value from the standpoint of diagnosis, sequelæ and treatment.

A twenty-eight year old nullipara had seven years previous to my seeing her inserted a wooden spool into the vagina. Thereafter she had occasional purulent discharge from the canal and menstruation, which had previously been regular, became painful. Three years after the introduction of the body, a swelling appeared in the left groin, which was opened by a physician, and a large amount of pus was evacuated. For three months the purulent discharge continued, the patient being confined to bed with high temperature. After the wound in the abdomen healed, the menstrual disturbances increased, the discharge becoming brownish-red in color; in the inter-menstrual periods she had a foul, thin, dark, discharge. She finally entered the hospital. The patient had always denied the insertion of the foreign body, although the history suggested it. Careful examination, however, pointed to the falsity of her assertions. As is shown in the figure, there existed cicatricial contraction of the vagina, so that the vagino-abdominal examination was negative. By recto-abdominal examination the uterus was found slightly enlarged, and behind it there existed a fluctuating sac the size of an orange, and in this sac a hard, movable body could be felt, which could be readily recognized as a spool. I finally managed to obtain from the patient the fact that she had inserted such an object into the vagina, as also particulars in regard to its nature. With considerable trouble the small fistula leading into the cavity above the stenosis in the vagina was found, and under chloroform it was thoroughly dilated, a canula was inserted, and a large amount of stinking pus was evacuated. While an assistant steadied the foreign body by means of his fingers in the rectum, I was enabled to seize it with the fingers and to extract it. The spool measured about one and a half inches long and was about three-quarters of an inch thick. The sac was washed out with 5 per cent. carbolic acid, and packed with iodoform gauze. On the following day this gauze was removed, and the patient menstruated without special pain. I afterwards treated the ste-

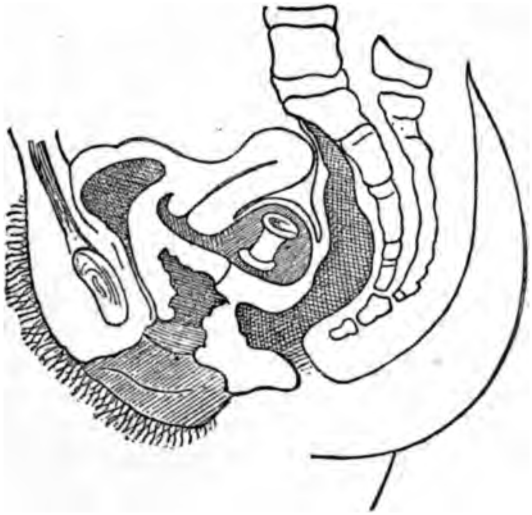

FIG. 33.

nosis by dilation and incision, and when the patient was discharged in six weeks medium-sized specula could be inserted.

In the second case, a young woman had been delivered two weeks previous to my seeing her; the perineum had been lacerated to the sphincter, and although the primary operation had been performed, union had not occurred. The patient's husband, who was a physician, detected fæcal matter in the vaginal discharges, and he and his colleague came to the conclusion that a recto-vaginal fistula existed. I was asked to see the case, detected no fistula, although there was unquestionably fæces in the vagina. On close questioning, the patient told us that a few days previously she had had a copious movement of the bowels, and that a portion of the fæces had passed into the vagina. The vaginal injections which had been administered had not sufficed to cleanse the passage of these masses, and they had acted as foreign bodies, causing the profuse, foul discharges.

The results of the presence of foreign bodies vary, of course, according as injury has been inflicted during their insertion; further, on the material, size, form, and length of retention of the object. In general all foreign bodies soon lead to catarrhal secretion, and they become coated with the same. As a result, in course of time triple phosphate and lime salts are deposited, and the foreign body becomes eventually the kernel of a concretion, even as happens in the bladder. Getchell has recently recorded an instance where a hairpin formed the kernel. Without question the cases frequently recorded by the older writers are similar instances, although certain of them were calcified fibromata, which had escaped from the uterus, and also vesical calculi, which had ulcerated into the vagina. The incrustation of the foreign body roughens its surface, and it becomes still more of an irritant with resulting increase in the catarrhal symptoms. In case of access of air or putrid matter the secretion from the inflamed mucous membrane may become purulent or the source of sepsis. Ulcers and fistulæ are apt to be caused, the ulceration eventuating in peri-vaginal abscesses, purulent pelvic peritonitis, septic infection, which, as in one of Hoffmann's cases and in Léonard's, may be fatal. Another of the sequelæ is hemorrhage, the result, not alone of the traumatism, but also of the secondary ulceration. In case of chronic ulceration, the granulations spread over the foreign body, which is thus fixed in cicatricial tissue from which it is difficult to extract it, and further, the cicatricial process may lead to atresia vaginæ of high grade, as in the cases seen by Säxinger, Carter, and myself.

In many cases the history will suggest the presence of a foreign body, although sometimes the patients have forgotten or do not know that they are in the vagina. Most careful examination may be necessary for their detection by all the methods at our disposal, and strict antiseptic rules should be followed.

We can lay down no general rules for the removal of foreign bodies, for we should choose in each case that method which permits our attaining our object with the least possible injury. Small and loose bodies in a *cul-de-sac* (worms and insects) may often be dislodged by copious injections of warm water through a speculum. Round and hard bodies, in case of narrow vagina, may be pressed out by a finger in the rectum, as Meissner did in the case of his two year old patient, who had a small stone in the vagina. Many foreign bodies may be removed under guidance of the finger, but for others the speculum must be used. In case of pins it should be remembered that the points are rarely directed upwards, but that they must be loosened anteriorly before they can be extracted. In case, during extraction, injury to the vaginal walls is feared, these must be protected by retractors. For the removal of larger objects the obstetrical forceps may be useful. The greatest difficulty in extraction is offered by those bodies which must first be diminished in size, as is the case usually with hard rubber pessaries. Where the object is buried in cicatricial tissue, this must be incised, rather than torn.

After the removal of the foreign body, attention must be turned to healing the damage inflicted by it. Although in general the symptoms, when they have not been very intense, will disappear spontaneously, often after-treatment is requisite, such as the use of antiseptic irrigation, to restore the parts to the normal. Cicatricial contraction, in particular, calls for treatment.

CHAPTER X.

INTESTINO-VAGINAL FISTULÆ.

IN general the fistula is between the rectum and the vagina, communication with other portions of the intestinal tract being exceptional, and then usually with intestine prolapsed in Douglas's pouch (usually coils of the lower ilium.)

A. Recto-Vaginal Fistulæ.

In reference to the regional anatomy of the recto-vaginal septum these fistulæ affect ordinarily the lower (perineal) and middle (rectal) divisions of the posterior vaginal wall. Exceptionally they are also found in the upper division, the peritoneal, the fistula extending from the vagina through Douglas's pouch into the rectum. They result either from traumatic causes, or else aside from these, through necrotic and ulcerating circumscribed sloughing of the recto-vaginal septum.

Most frequently fistulæ result during labor, in particular where the obstacle to delivery is great. Contrarywise to that which holds for vesico-vaginal fistulæ, the cause is rarely prolonged pressure, since the recto-vaginal septum, except in funnel-shaped pelves, or where there is anchylosis of the coccyx, is seldom for any length of time exposed to pressure, the reverse being true of the vesico-vaginal septum. In the majority of cases the fistulæ have their origin in lacerations of the distended posterior vaginal walls. The deep recto-vaginal fistulæ result either after rupture of the posterior commissure or else after complete rupture of the perineum.

Above the perineal division of the recto-vaginal septum, fistulæ result from obstacles to delivery due to abnormal tension above stenosed parts, to tumors, or to pelvic contraction. Narrowness and rigidity of the vagina lead, ordinarily, to laceration which often extends into the rectum. Generally traumatism during difficult labor is the cause of fistulæ. Forceps, manual extraction, cephalotripsy, etc., play a large part in the etiology of recto-vaginal fistulæ. Operations on the genital organs for atresia, the extirpation of tumors from the posterior vaginal wall, etc., are also factors. Unskillful administration of enemas may result in perforation of the recto-vaginal septum, and I have myself noted such an instance in a puerpera. We have already noted the fact that foreign bodies may cause fistulæ, in particular pessaries. The seat of the fistulæ varies greatly, those in Douglas's fossa, accompanied by prolapse of intestines, being of peculiar interest. Degenerated extra-uterine gestation sacs and ovarian cysts, may ulcerate through Douglas's pouch, and leave a fistulous tract; and further still, pelvic abscesses, diphtheritic and syphilitic ulcers, carcinoma and other new growths.

The etiological factors noted act almost entirely in the adult. Recto-vaginal fistulæ have very seldom been met with in children. Bednar reported an instance in a four weeks old infant, from gangrene of the vagina. The separation of the slough was followed by a fistula. Cellulitis of the right arm complicated the case, and the child died on the 21st day. G. T. Witter has recently recorded an instance in a seven months old child. For some months it had been troubled with aphthæ, was much emaciated and complained of great pain on defæcation. Passage of fæcal matter by the vagina was noted and on examination a fistulous communication between the rectum and the vagina was found. With improvement in the child's general condition, the administration of enemas, the tamponade of the vagina with cotton dipped in carbolized glycerin, the fistula closed, and the child was discharged in ten days.

Aside from the cause of the fistula, the length of time that it has existed has an influence on the size. There is present a tendency to cicatricial contraction. Generally the fistula, when not caused by extensive breaking down of new growths, appears as a roundish gap on the vaginal and the rectal walls. When caused by traumatism one opening is generally larger than the other, the larger being on that wall where the traumatism or ulceration began. In case of ulceration this is not always so, since the suppuration may extend and a secondary outlet may communicate with the first. A valve over the vaginal opening of the fistula is often formed by overlapping of the resisting muscular layer of one of the vaginal rugæ. In a twenty-nine year old woman under my observation, who had a funnel-shaped fistula extending downwards obliquely towards the rectum, the vaginal opening was covered by a tongue-like valve from the lower end of the columna rugarum. The fistula dated from her first delivery, which was a difficult one. Immediately after delivery there was hemorrhage from the vagina and the rectum, and on the sixth day thereafter passage of watery fæces and flatus by the vagina. In case of high-seated recto-vaginal fistulæ, the vaginal opening is often directed from the mid-line, and fixed there by a cicatricial band. In two instances I noted this deviation to the left.

The chief accompaniment of a recto-vaginal fistula, spontaneous passage of fæces and of flatus by the vagina, makes the complaint most unbearable and is the cause of great depression, owing to the loathsome nature of the affection, and the resulting irritation of the neighboring parts. This symptom is not, however, always of the same intensity, but it depends on the size and the direction of the fistulous tract, as well as on the consistency of the fæces. Nevertheless, even under most favorable conditions, there is always likelihood of occasional uncontrollable passage of gases or of fluid fæces. The remaining symptoms from these abnormal communications, such as inflammation and erosion of the borders of the fistula, the foul vaginal discharge caused by mixture of fæcal matter with the vaginal secretions, the vaginitis, depend essentially on the attention which is paid to strict cleanliness. As long as there is no ulceration, these further symptoms, under favorable conditions, are scarcely noticeable, and exert scarcely any effect on the patient's general state.

The ultimate result depends on the cause, size, and complications of the fistula. Fistulæ, the result of carcinoma, simply increase in size; traumatic and ulcerous fistulæ shrink considerably in the process of cicatrization, and this is the method of cure, frequently, in case of small fistulæ. Occasionally spontaneous healing results in recent large communications between the rectum and the vagina, those following on delivery for instance, which, owing to the traction at the time of occurrence, appear still larger. Winckel records an interesting instance of spontaneous cure within two weeks after delivery. During the exit of the head the perineal division of the septum was torn so that the hair on the fœtal head could be seen in the rectum. Large fistulæ, with cicatricial edges remain stationary, and cause greater symptoms than the smaller. Very small fistulæ may be enlarged at the next delivery, and again diminish in size, even disappear entirely, as I noticed myself in a case where a small fistula remained after a perineorrhaphy. At the next delivery it was enlarged so that it was patent for the finger, and yet three months *post-partum*, it could not be detected.

The etiological connection between difficult labors and puerperal ulcerations makes clear the frequent association of recto-vaginal and vesico-vaginal fistulæ with cicatricial contraction of the vagina. The complication with chronic ulcers and with tumors, leads to permanency of the fistula. We would make special mention here of the rare cases where, in the presence of deep-seated recto-vaginal fistulæ, tumors had prolapsed through Douglas's pouch into the vagina. Winckel saw an instance where the tumor was composed of intestinal coils as far as the sigmoid flexure. The patient had been delivered by forceps, and entered the Dresden lying-in hospital later for the relief of escape of fæces by the vagina. In the upper portion of the posterior vaginal wall, there existed a tumor the size of an apple, and in its centre was an opening which led into the sigmoid flexure. By the side of this irreducible tumor, to the right and to the left, was a large opening into the rectum. Winckel made the diagnosis of recto-vaginal fistula through which the upper portion of the sigmoid flexure had inverted and had united to the vaginal borders of the fistula. He endeavored to re-invert the gut by the colpeurynter, and by loosening the portion of the intestine which was adherent, and when he had accomplished reposition he sewed the edges together, inserting fifteen sutures. The patient was entirely relieved.

I have seen a very rare instance of prolapse of a dermoid cyst through a deep-seated recto-vaginal fistula. A woman of thirty-nine, who had borne nine children and miscarried once of twins, was delivered for the eleventh time on the 25th of April, 1875. The breech presented and the after-coming head was only extracted manually after great effort. The placenta was artificially removed on account of profuse hemorrhage. On the ninth day of the puerperium, the patient had an attack of pelvic peritonitis accompanied by high fever and great pain. At the same time a profuse diarrhœa set in and a purulent vaginal discharge. In four months particles of hair began to be passed in the vaginal discharge, and a large mass from the rectum. A few days afterwards the vaginal discharge became fetid and contained fæces. These symptoms lasted intermittently for a number of months. In nine months after delivery the menses recurred at normal intervals. With the disappearance of the inflammatory symptoms the discharge, and the passage of hair and fæcal matter, ceased. I saw the patient first in June, 1876. She was thin and anemic, but able to attend to her household duties. The vagina was distended by a tumor the size of a fist, and pear-shaped, and resembling a polyp. The surface of the tumor was covered in places with hair which could readily be removed by the finger. The pedicle was as thick as the finger and proceeded from an opening in the left lateral fornix, through which the finger could be passed into a cavity resembling that of Douglas. There was a second opening at the lower border of the pedicle, which extended into the rectum. The uterus was elevated and anteposed, not specially movable, and a trifle enlarged. There was no palpable exudation in the pelvis, and the ovaries and the tubes could not be felt. I reached the diagnosis of inverted dermoid cyst prolapsed into the vagina: my explanation of the occurrence was that a dermoid cyst (of the left ovary?) adherent in Douglas's pouch, had proved the obstacle to delivery, at which time the fornix vaginæ was torn transversely, and through this tear a portion of the cyst prolapsed and this was the beginning of the inversion. The communication with the rectum did not form till later, since fæces did not pass per vaginam till the fourth month after delivery. I removed the cyst (*vide* Fig. 34), and the patient recovered well, but as yet she has refused operation on the fistula.

The diagnosis of recto-vaginal fistula is easy ordinarily, since we can readily examine the recto-vaginal septum. The finger may usually detect even a small fistula when its borders are thickened. The patency of the fistula may be determined by one finger in the rectum, and another in the vagina. In case of very small fistulæ the sound is of assistance.

If the matter is still in doubt, injection of fluid into the rectum will settle it. Further still, the posterior vaginal wall and the anterior rectal may be exposed by the speculum. As for differential diagnosis, the only thing which might simulate the symptoms of fistula is the passage of air and of fæces into the vagina from without. (See under Foreign Bodies in the Vagina, for a case in point.)

The treatment of a recto-vaginal fistula can only be effective when it is possible to control the ulcerative process, and to cause regular cicatricial contraction of its borders, and when the size of the defect permits of closure. At the outset, then, a good result is rarely possible in case of carcinomatous fistulæ or those complicated by a chronic ulcerative process. Fortunately, the reverse holds true for the large majority of recto-vaginal fistulæ, and the results of treatment are not unfavorable, although it cannot be stated that their cure by operation is certain. The tendency which we have noted towards shrinkage, and the not infrequent instances of spontaneous cure, exemplify this statement, especially when the fistula is of rather recent date. In case of fistulæ following on labor, they should be left alone for six weeks before an attempt is made at artificial repair. Separation of the recto-vaginal wall, of recent traumatic origin, should, when possible, be repaired by suture. Defects the result of ulcerating processes should be incited to cicatrization of the borders.

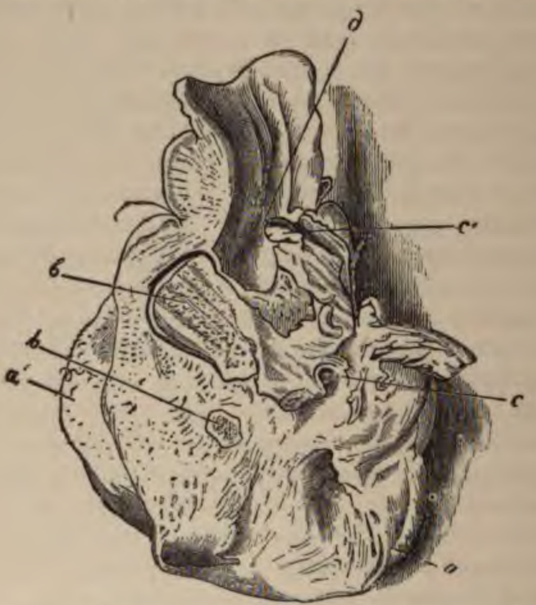

FIG. 34.—LONGITUDINAL SECTION THROUGH THE EXTIRPATED TUMOR. *aa'*, External surface of the inverted dermoid; at *a'* a few hairs are seen. *b*, bones. *c*, teeth alveoli. *c'*, a tooth. *d*, inversion opening covered with smooth peritoneum.

For this purpose rest and cleanliness, irrigation twice or thrice daily, and small lukewarm enemas, suffice. Tampons, carbolized or glycerinized, should be inserted into the vagina; where the ulcers are not healthy-looking, antiseptic applications may be made *per vaginam*, with occasional cauterization. In case of chronic recto-vaginal fistulæ the treatment consists either in cauterization or in denudation followed by suture.

Cauterization is applicable alone to small fistulæ, the size of a pea even, and results more frequently in cure than do similar vesico-vaginal fistulæ. Since the object is to destroy entirely the cicatricial tissue along the edges, and to cause the subsidence of fungous granulations, the caustic must be applied to both openings of the fistula. Lunar caustic, less frequently fluid caustics (nitric acid, tincture of cantharides, liq. hydr. nitr., etc.), are used. After cauterization the immediate effect is often a slight enlargement of the fistula, and later marked shrinkage sets in. It is advisable not to cauterize oftener than once in eight days. In cicatricial fistulæ the cautery acts more energetically. R. Liston used with success the glowing wire. Dieffenbach laid stress on the necessity of causing concentric shrinkage. It was his custom to touch the rectal side of the fistula with nitrate of silver, and then for days afterwards he applied the actual cautery to the vaginal opening and the fistulous tract as well. Both vagina and rectum were then filled with charpie, and mild or strong injections, according to the case, were administered occasionally. Latterly, frequent application of the actual cautery has been rightly condemned by Hegar and Kaltenbach, since the cicatricial tissue interferes with subsequent denudation and union by suture. In general, the small oblique fistulæ are best suited for cauterization. Small thin-walled fistulæ with sharp cicatricial borders are rather made larger than smaller by cauterization.

The method of denudation and suture has the advantage that it is applicable to large and deep-seated fistulæ, but the technique, even as in case of other vaginal fistulæ, is difficult, and not infrequently the operation fails even in skilled hands. The reasons for failure depend not alone on the contact of fæcal masses with the wound, and the varying traction according to the amount of gas in the rectum, and the muscular contraction, but also, in particular, on the difficulty in reaching the fistula when it is deep-seated, on the thinness of its walls when it is seated in the middle segment of the recto-vaginal segment, and lastly, in case of fistulæ on the boundary between the rectal and perineal segments, on the unequal thickness and tension at the upper and the lower borders. Further still, the borders of the thin and loose rectal mucous membrane readily prolapse into the wound if it be not perfectly secured by suture, and then again the sutures readily tear out.

These possibilities have caused surgeons to busy themselves, for long, in attempts at overcoming them. On the one hand, in order to get rid of contact with the contents of the intestine, and to control the movements of the rectum, protracted constipation has been advocated, the bowels having been thoroughly cleansed before operation. Recent authors, Simon, and later Hegar and Kaltenbach, have objected to this constipation-method. Without question the first movement from the bowels after ten to twelve days constipation, and the pressure on the line of union by the hard fæcal masses, are strong reasons for objecting to the method. On the other hand, the maintainance of diarrhœal discharges is not to be advocated, on account of the ease with which fluid fæcal matter may penetrate into the wound. Hegar and Kaltenbach recommend the following procedure: Before the operation the bowels should be thoroughly emptied; for the first three days after operation the diet should be milk and soups. On the evening of the fourth day, about one and a half grains of calomel should be given, and on the next morning a glass of bitterwasser. As soon as the bowels begin to move the rectum should be explored, and hard scybala are to be removed by the finger or else softened by an enæma. On the following days a glass of bitterwasser in the morning generally suffices to move the bowels without difficulty. In order to prevent pressure and traction on the fistula by collection of gas and fæces in the rectum, and in order to control the movements of the lower rectum, R. Liston and Copeland have advocated incision of the sphincter ani, a procedure which has found advocates in Baker Brown, Richet, and Demarquay, while Dieffenbach and Simon have rejected it. Simon stated that the same aim could be attained by dilatation of the sphincter, and that incision was therefore unnecessary, and in an instance which he has recorded where the sphincter was incised, he noticed that twelve hours after both gas and water were retained. Although in this instance it is apparent that the incision may not have been properly done, it follows from Simon's results that dilatation will suffice.

As far as I know, no one has treated of the operation for the repair of rectal fistulæ better than G. Simon, and I follow his description. The operation may be performed either from the vagina in a similar manner to that for the repair of vesical fistula, or else after incision of the perineum by the rectal suture, or finally from the rectum.

1. *Denudation and Suture from the Vagina.*—To expose the fistula Simon recommended a fenestrated speculum, but this instrument narrows the space and makes the vaginal wall too tense, and for these reasons it has not been generally used. The depression of the anterior vaginal wall by an elevator, and similarly the lateral walls by retractors, and the pulling down of the posterior vaginal wall by forceps or tenaculum, or by the finger of an assistant in the rectum, these measures suffice for exposing the fistula except where it is fixed by cicatrices or there exists stenosis.

When the shape of the fistula allows, the attempt should be made to cause transverse union, since thus we may expect less traction on the united edges. The denudation is funnel-shaped, and many interrupted sutures are inserted, or else a number of superficial and deep. Either fine silk or wire should be used, and results have been obtained with catgut.

2. *Incision of the Perineum from the Fistula and Triangular Union.*—This method, which has been resorted to in case of large fistulæ, such as those which exist from incomplete union of a laceration of the perineum extending into the rectum, Simon has also used and recommended in case of small fistulæ when they are in the perineum and in its immediate neighborhood. In such instances obtaining union by simple denudation is often a very difficult matter, while after incision of the perineum it is far easier to denude, and traction from the perineum is done away with. This traction must be carefully guarded against, further, by not inserting the perineal sutures too deeply. Dieffenbach's objection that incision of the perineum caused a large wound with consequent greater risk of non-union, and with increase in the size of the fistula, has been proved untenable by Simon's results, and the everyday good results from plastic operations speak in favor of this method in case of fistulæ which occupy this locality

3. *Operation from the Rectum*—Failures in operations from the vagina, and in order to cure a transverse fistula in the upper third of the recto-vaginal septum, led Simon to attack the fistula from the rectum where the posterior rectal wall is readily accessible. This aim is readily attained under deep anæsthesia, the rectum being exposed by Simon's large spoon-shaped speculum and lateral retractors, and the anterior wall being pulled down by two double tenacula. (Fig. 35.) With the patient in the dorsal position the anterior rectal wall appears transversely and posteriorly across the anus. Careful denudation may be controlled by the vagina. The sutures are inserted from within outwards, from the vaginal surface towards the rectal, about ½ cm. from the border of the wound on the vaginal side, and issuing at the edge of the border on the rectal side. In this way prolapse of the rectal mucous membrane between the edges of the wounded surface is prevented. The sutures are knotted in the rectum, and Simon removed them from the vagina owing to the difficulty of so doing from the rectum. Herein I cannot agree with him, and I question if the advice is acceptable. Simon claims that this method is the only one which assures exact union in case of fistulæ in the upper third of the recto-vaginal wall.

According to Emmet the operation *per rectum* is only applicable to small fistulæ where the defect is greatest in the vagina and the edges cannot be approximated from the vaginal side. In these instances an incision may be made into the mucous membrane on each side of the fistula, and parallel to the axis of the canal, in order to overcome tension, and then the operation from the vagina is the simplest method and most likely to be followed by good results, the hemorrhage being less and the sutures not tearing out so readily. Emmet notes a further indication for the operation from the rectum. When, as the result of sloughing after protracted labor, a vesico- and a recto-vaginal fistula exist in the midst of contracted cicatricial masses, it may happen that the vesical fistula can be well exposed and operated upon, while the rectal fistula is concealed behind the cicatricial mass. This mass should not be incised in order to expose the fistula, since it answers the purpose of assisting in causing retention of urine by keeping the urethral walls in contact. In such instances the fistula must be closed from the rectum, or else, when this is not possible, from the vagina, without eyesight, however, but under the guidance of the finger. This is a difficult procedure, of course, but Emmet has succeeded in a number of instances.

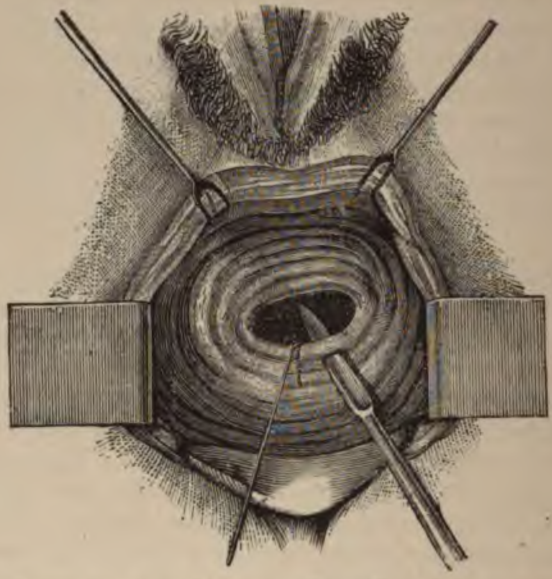

FIG. 35.—SIMON'S OPERATION FOR THE REPAIR OF A VESICO-VAGINAL FISTULA FROM THE RECTUM.

In my opinion Simon is deserving of our thanks chiefly for pointing out the methods after which it is possible to cure these recto-vaginal fistulæ. The choice of method will vary with the case, and it will be different according to the locality and form of the fistula. Strict rules for each case cannot be formulated. Winckel's case, to which we have referred, proves that under circumstances even large fistulæ, deep-seated, can only be attacked and even cured from the vagina. In case of small fistulæ in the median division of the septum it is advisable to attempt cure by simple denudation before incising the perineum, and the same holds for fistulæ near the perineum. Ordinarily one or another of the methods advocated by Simon will be followed. Occasionally, in case of fistulæ with thin edges in the median division, it may be advisable to attempt to cover them by a plastic operation with folds from the vagina, as Kidd did in case of vesico-vaginal fistula. Maürer records a case of cure by transplantation of a flap of rectal mucous membrane over the denuded fistula after having split the sphincter. In other instances cicatrices must be divided in the rectum or in the vagina before resorting to operation. Further, the sutures may be passed from both sides, those towards the rectum being of very fine carbolized silk or catgut, and those towards the vagina being stronger, more numerous, and including more tissue. The sutures should always be removed from the side where they are knotted or twisted. The time for removal depends on the material, according to ordinary surgical rules. In addition to the methods of treatment which we have mentioned, there are others which are largely of historical interest, such as compression with metallic plates or compresses from the rectum and vagina (Cullerier, Nélaton, Duparque).

B. ILEO-VAGINAL FISTULÆ, AND ANUS PRÆTERNATURALIS VAGINALIS.

When coils of intestine are in fistulous communication with the vagina, then either the continuity of the intestine is entirely broken by the fistula and the upper end of the intestine discharges its contents into the vagina, anus præternaturalis vaginalis, or else the continuity is not broken and the fistula is purely a partial defect in the intestinal wall communicating with the vagina, fistula ileo-vaginalis. Such is Simon's definition, and he was the first as far as I know to sharply differentiate the conditions.

The anus præternat. vaginalis is formed as the result of traumatic rupture, generally *intra-partum*, of Douglas's pouch, prolapse of the intestinal coils into the vagina, the formation of adhesions, and gangrenous separation of the intestine, associated generally with symptoms of incarceration. Since such instances are usually followed by death, the number on record is small. Generally but one part of the intestine is affected, although a number of coils may be implicated, as happened in the case reported by Bartels.

L. H. Petit has with great care collected all the instances of fistulous communication between the small intestine and the vagina, as also those between the intestine and the uterus, and given the histories *in extenso*. Of forty-two instances in twenty-one the communication was between the small intestine and the vagina, Smellie's and Penell's cases not being included, since they appeared doubtful. Of these twenty-one cases only eight can be classed as anus præternat. vag. Here belong the cases of Birkett, McKeever, Favera, Jones, Cassamayor, Heine, Bartels. The cases of Roux, Verneuil, Kiwisch, Gussenbauer, certainly dated from difficult labor, and without prolapse of intestine having been noted the contents of the intestine were passed per vaginam on the sixth to the tenth day after delivery. With the exception of Favera's case, where the cause was brutal rape of a ten year old child, in all the instances there was traumatism during labor as the cause. In a number there is no statement in regard to a mechanical obstacle to labor. Jones witnessed prolapse of the intestinal coils in a healthy woman of twenty-four, in the third month of her second pregnancy, as the result of rough examination on the part of the "physician" whom she had consulted on account of pain in the abdomen which had set in after lifting a heavy weight. Cassamayor's often-quoted case concerns a VII-para after miscarriage at the fifth month. In Heine's case the vaginal fornix was torn during the removal of the after-birth. Generally, where long coils are prolapsed they are taken for the umbilical cord or the membranes twisted into a cord. In Jones's cases nineteen and a half feet of intestine were separated from the mesentery, one end of which was completely torn, and the other only connected to the intestine by a band. Jones was led astray in his diagnosis and amputated the intestine, the patient surviving for seventeen days. McKeever's patient, a II-para of twenty-six with narrow pelvis, was delivered by perforation after a long labor, and without doubt the cervico-vaginal vault was torn. On the following morning a "substance" six inches long was found in the vulva and taken for membranes. Since after two days interval they had not been expelled, one of her attendants pulled on them strongly until the patient's screams made her desist. McKeever found about 4¾ feet of gangrenous intestine prolapsed with substance defects here and there. He also detected a vesico-vaginal fistula. Cassamayor's patient, where the intestines had prolapsed to the thigh, necrosed and perforated, while waiting for her medical attendant had tied them as high as possible. In Heine's case two and a half feet of intestine, reaching about to the knee, had been drawn down by an attendant who thought the placenta was thus being detached.

In all these cases prolapse of the intestines have caused more or less marked symptoms of incarceration, with consecutive necrosis and peritonitis. As the result of the injury, only one of the patients died (Jones's), and she at the end of seventeen days.

In case of anus præternat. ileo vag. there are originally two separate openings from the intestine into the vagina, the one belonging to the upper, the other to the lower extremity of the small intestine. The vagina represents, as Heine has pointed out, the widened extremity of the intestinal canal which leads into the vaginal anus; the lower extremity together with its continuation into the large intestine is shut off from the fæcal masses. In consequence of the incomplete digestion of the intestinal contents, the patients emaciate and complain of hunger. The retention of particles of fæces in the vagina leads to the local irritation of the mucous membrane and of its surroundings, on which we have laid stress.

The outlook for spontaneous cure of an anus præternat. ileo vag. is slight, since from the recorded cases it is apparent that union and closure of the separated intestinal extremities has rarely occurred, the closure being brought about by retraction of the spur, by narrowing of the openings of the infundibulum. The more interesting, hence, is McKeever's report of spontaneous cure of an anus præternat. vag. which followed on pregnancy. After absolutely no fæces had passed by the rectum for two years, the patient (in the fourth month of pregnancy?) complained of great pain and tenesmus, and a half hour afterwards she had a stool by the natural passage, consisting of a mass of black, hard, fæcal nodules. Afterwards the intestinal contents were passed in part by the rectum, in part by the vagina; the amount, however, passed by the vagina diminished gradually for a few months, and finally ceased altogether. McKeever remarks that the influence of pregnancy in affecting the change was marked, and the more so as the uterus projected into the abdominal cavity. The patient was delivered at home, without assistance, of a small but living female. The placenta was passed spontaneously, and she nursed her baby. During the puerperal state the intestines were evacuated by the natural passage, and when McKeever examined her the only trace of an artificial anus which he found, was a slight projection on the posterior vaginal wall which marked the site of the previously existing anus. The patient, however, still retained her vesico-vaginal fistula.

Although in Favera's case it is stated that there remained only a small recto-vaginal fistula, yet the particulars in regard to the case are too few to justify the belief that here also there occurred cure of an anus præternat. vag.

In regard to diagnosis we must first establish the fact that the abnormal communication is with the small intestine, and next that it is due to complete opening of an end of the intestine and not to a partial defect in the wall. The first point is proved by the nature of the intestinal contents, which consist not of fæces, as in case of a recto-vaginal fistula, but of chyme. Fæcal matter and foul odor may, however, be present, and then in addition to the intestinal contents, we must note the rapidity with which the characteristic ingesta appear at the fistula. (In case of fistula of the small intestine, characteristic remnants of the ingesta may be passed by the abnormal opening one to two hours after a meal.) To test this point, among other means, the lycopodium seeds answer well, for they are readily recognized in the intestinal contents. On the other hand the absence of a communication between the rectum and the vagina may be proved by inserting a speculum into the rectum and injecting milk or colored fluid, which in case there exists a recto-vaginal fistula, will pass out by the vagina. The sunken abdomen, the extreme emaciation, the hunger, these speak for the seat of the fistula being the small intestine. That the communication is the result of an anus præternat. and not of an ileo vag. fistula is proved by the existence of two openings into the vagina, separated by a projecting spur. If, as in Cassamayor's case, there is but one opening, the examination with the sound or, better, with the finger will prove that the lumen is patent in only one direction, and this speaks for anus præternat., and also the history that the abnormal communication followed on the loss of a prolapsed coil of intestine.

O. Weber and C. von Heine have devised and followed a method of treatment of anus præternat. ileo vag. which fulfills every indication. It aims at restoring the lumen of the intestinal canal, and then at the closure of the fistulous opening into the vagina. Weber formulated the first steps of the method, and after his death Heine completed it and obtained a perfect result. First the blades of a modified Dupuytren's intestinal scissors (Fig. 36) were inserted into the upper and the lower openings of the intestine to the extent of one and a half inches. The spur between the blades was then cut through by screwing them together and leaving them till the aim was secured. With the separation of the spur the lumen was opened up, and the anus præternat. was converted into an ileo-vag. fistula.

Then the opening between the intestine and the vagina was denuded and sutured even as in case of a simple recto-vaginal fistula. This case is the only one in which this method was followed by success, and it is of such interest that I will record it.

It concerns a slightly-built woman of twenty-three, of tubercular parentage, who at her first delivery suffered a large rupture in the vagina following on artificial removal of the after-birth. The unfortunate "accoucheur" inserted his hand through the laceration into the abdominal cavity, and thinking that he had grasped the placenta, pulled down a coil of intestine, removed it, and did not recognize his error; sixteen hours thereafter the placenta was spontaneously expelled. Dr. Winterweber saw the patient one hour afterwards, and found the abdomen swollen and tender, the temperature elevated and a pulse of 144. Between the thighs lay a long piece of the small intestine, about two and a half feet and reaching to the knees. The intestine was separated from the mesentery, dark-red in color, in places black, and filled with gas and fluid. In the posterior *cul-de-sac* he found a transverse laceration. Rest in bed, ice, morphine, and antiseptic cloths over the intestine, kept the patient in good general condition, and on the fifth day the intestine separated. At the end of four weeks the patient left her bed, but she did not improve in health, and she complained of constant hunger. The constant passage of grumous brown intestinal contents from the opening in the vagina, which caused severe excoriation of the skin and the external genitals, impelled Winterweber to send the patient to the surgical clinic at

Heidelberg, which was then in charge of O. Weber. He found extreme emaciation, no fever, constant appetite, and all the functions, except the rectal, in order. The fæces were passed from time to time from the reddened and sensitive vagina. None were passed by the anus, and the patient never had the desire to go to stool. Only the excoriated skin and mucous membrane were painful. The patient disseminated a fæculent odor. In the posterior vaginal *cul-de-sac*, to the right of the os, there were two separate intestinal openings, the one a trifle above the other. The anterior median one alone gave exit to the intestinal contents. The sound entered it to the left and upwards, and into the other to the right and upwards. The intestinal mucous membrane was prolapsed through both openings.

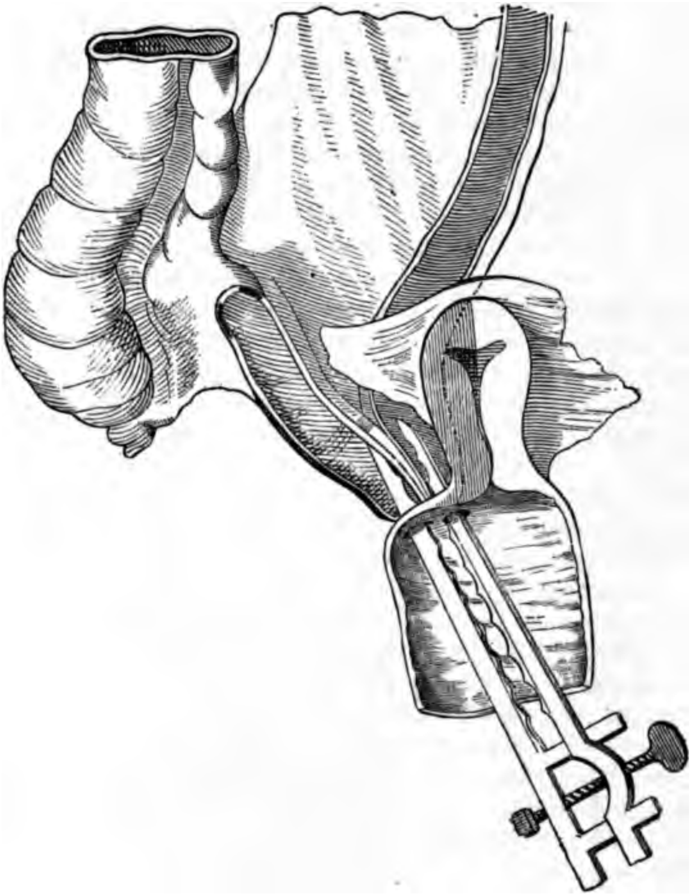

FIG. 36.

Weber endeavored to convert the anus præternat. into a fistula stercoral., and after thorough cleansing of the parts, he passed the blades of a modified Dupuytren's scissors into both openings to the extent of about one and a half inches, and clamped the spur between them. On the third day the first natural passage since the delivery occurred. At the end of six days the instrument was removed, and there remained but one opening of the intestine into the vagina. Over this the opposed rectal wall still fell, and caused partial closure of the lumen. The attempt was then made to prevent this prolapse by a sponge on a holder, and this kept the intestinal canal patent, but caused intense inflammation of the vagina and the vulva. After further treatment, the hot iron was applied to cause shrinkage and closure of the fistula, but this only partially succeeded. The patient then returned home for awhile, where she remained in bed for six and a half months, when she was again brought to the clinic. Weber had in the meantime died, and Heine undertook the treatment. Since the spur still projected considerably, he again applied the clamp. After awhile, since the fistula had contracted down to the size of the top of a finger, Heine denuded the edges of the fistula and converted it into a transverse slit which he united by suture. Union resulted except at a point to the left covered by the anterior lip of the cervix, and at a small opening in the right angle of the wound, which shortly closed spontaneously. .Since slight cauterization was negative in its results, Heine denuded again with implication of the remnant of the posterior lip. In a few days a small amount of fæcal matter was passed from an opening at the inner angle, the size of a large pin's head. This healed eventually under repeated applications of tr. cantharid. and ung. præci. rubr. The patient regained her strength quickly, but in three months tuberculosis developed and she died from this disease. At the autopsy Heine found complete cure of the anus præternat.

In comparison with this method of Heine's the other procedures are not of special value, as for instance Jobert's plan of separating the upper opening from the vagina and sewing it into an opening made between the rectum and the vagina. Simon's plan is not preferable, and it consists in making a large opening between the rectum and the vagina below the site of the ileo vaginal anus and then in closing the vagina transversely, so that this canal forms part of the intestinal canal. Finally we would mention a still more practical plan, that of Cassamayor, which consists in so connecting the anus vaginalis with a rectal fistula as to leave a broad lateral union between the upper extremity of the small intestine and the rectum. With this end in view Cassamayor inserted one blade of a rectal scissors into the opening of the small intestine, and the other into the rectum, and caused the intervening portion to separate. He was not able to obtain closure of the stercoral fistula, however.

All these procedures, aside from risks and inefficiencies, are open to one and the same objection, namely, that a considerable part of the intestinal canal is shut off from the intestinal contents, and that these, hence, are not entirely digested.

From Petit we learn that Roux attempted the following procedure: Laparotomy, resection of the loosened extremity of the injured intestine, and suture of the opening. Owing to the small opening through which he worked, however, he mistook the portion of intestine, and, as the autopsy proved, he sewed the intestine not to the lower but to the upper end of the descending colon.

Weber and Heine's procedure is not always as simple as it seems from the report of their case. Cassamayor, for instance, found only one opening into the small intestine, and Wilms (Bartel's report) met with such complicated conditions that Heine's procedure was out of the question. For certain of these cases Cassamayor's method, therefore, must be considered relatively the best, and his failure in securing union of the fistula is not to be accounted against it. The cutting off of the part of the intestine below the opening into the intestine will always result in the patient's nourishment suffering, since the perforated coils uniformly belong to the lower ilium; still the greater part of the small intestine functionates, and Cassamayor's plan fairly well subserves the desired end. Before, however, in case of one opening, we decide to follow Cassamayor's method, it is advisable to dilate the fistula, and whenever possible to find the opening of the projecting intestinal extremity, and when we can Heine's plan should certainly have the preference. Aside from these methods there remains the possibility of performing laparotomy, loosening the adherent intestines, resecting them, and suturing them, even as Roux did in his unfortunate case. Petit remarks with justice that to-day, under antiseptic rules, such a procedure would not be so dangerous as in Roux's time (1828), particularly if we attend to the technique of to-day in regard to the intestinal suture. We cannot, however, grant Petit's statement that the risk from such an operation would be less than in case of removal of an adherent ovarian cyst. Although Weber and Heine's procedure in comparison with laparotomy is less dangerous whenever it is practicable, under other conditions laparotomy should be resorted to since by it alone, after Heine's method, are we able to secure normal results. In case of anus præternat. ileo uterinus laparatomy alone offers the hope of cure. So far, however, instances of the kind, where such an operation was resorted to, have not been recorded.

In case of fistulæ between the vagina and the small intestine, properly so-called, there exists a single opening into a coil of the adherent ilium lying in Douglas's *cul-de-sac;* there is present only a partial defect in the wall of the intestine, and through it a portion of the fæcal matter is discharged, the rest following the normal route towards the anus.

The formation of such a fistula necessitates the adhesion of a portion of the ilium to the peritoneum covering in the vaginal vault. As the result of ulceration, a communication is formed between the vaginal and intestinal walls. The ulceration depends occasionally on laceration of the vagina, more frequently on puerperal inflammatory processes; it may, however, be dependent on other causes, such as cauterization (Simon). It may also follow on the rupture of an extra-uterine gestation cyst, and on degeneration of malignant growths of the vaginal and neighboring intestinal wall.

Kiwisch saw an ileo-intestinal fistula after rupture of the cervix, of the bladder and of the vaginal fornix, the cause of which he believed to be partial pressure. The result, no prolapse of intestine, spontaneous cure in fourteen days, speak for an ulceration into a small portion of the intestine, in consequence of pressure. In Dahlmann's case, where a vesicovaginal and an ileo-vaginal fistula formed after difficult version, a likely cause was primary rupture. In the remainder of the cases occurring during the puerperium there is no reference to laceration as a cause, although considerable trauma resulted during labor, as, for instance, in Veit's, Breitzmann's, Thurmann's, Roux's, Demarquay and Verneuil's, and Gussenbauer's cases.

Colman and Müller have recorded instances of ulcerous communications between the ileum and the vagina from extra-uterine gestation cysts.

In Simon's case the use of caustic potass for the cure of a small vesicovaginal fistula lying in the midst of dense adhesions, resulted in perforation of a portion of the small intestine.

Hufeland has recorded an instance of fistula between the vagina and small intestine due to carcinoma of the uterus and the vagina.

The usual seat of the vaginal opening of these fistulæ is the posterior *cul-de-sac*, since it is above this that the intestines ordinarily lie. Breitzmann and Dahlmann have, however, seen fistulæ anteriorly in the vesicouterine pouch.

Owing to the small size of these fistulæ and the practical continuity of the fæcal current, their course is more favorable than that of anus præternat. ileo-vaginalis, and there are four recorded instances of spontaneous cure (Breitzmann, Kiwisch, Veit, and Dahlmann) [in the latter the result of cauterization by nitrate of silver].

In general, spontaneous cure will depend on the size of the fistula and the complications; the larger the fistula, the more copious the escape of fæces, the more the conditions approximate those of anus præternat. The most frequent complication is pelvic abscess, which ordinarily leads to depreciation of the patient's strength. So far the results from operation have not been favorable, but it does not follow that such will be the case in the future with the better means at our disposal.

The diagnostic points are: 1. The seat in the posterior *cul-de-sac*, at the upper part, which is covered by peritoneum, (exceptionally in the anterior fornix). 2. The thin grumous chyme which flows through the fistulous opening. 3. The single opening through which the sound may be passed both upwards and downwards. 4. The intact condition of the portion of the rectum near the fistula. 5. The cause being ulceration with or without the concurrence of inflammatory puerperal conditions, generally without symptoms of incarceration, in no instance association with prolapse and expulsion of intestine. 6. Passages by the rectum regularly occurring. The characteristics noted under 3, 5, and 6 differentiate at once anus præternaturalis.

The treatment of fistulæ between the vagina and small intestine is similar to that of recto-vaginal fistulæ, cauterization, or denudation and suture. Where the fistula is small, the reported cases of cure from simple cleanliness, injections, frequently changed tampons, speak possibly in favor of the slower but less radical method by cauterization. Where the fistula is larger, however, as in Heine's case, where it was formed artificially from an anus præternat., then the above measures are not likely to be followed by good result, and the denudation method is requisite. In these instances the operation is only possible *per vaginam*. They are less readily accessible owing to their elevated seat and the complicating cicatricial tissue. It may be necessary as in Heine's case to denude at the same time the lip of the cervix. The technique is similar to that in cases of other fistulæ.

A. Bidder, in a remarkable case (also seen at an earlier stage by Röseler) of anus præternat. colo-utero-vaginalis, which had changed into a utero-vaginal fistula, was able to cause closure by dissecting off the intestinal mucous membrane from the uterus and vagina, and thus obtaining broad surfaces for union of the vaginal flaps. The dissected intestinal mucous membrane projected into the intestinal lumen, and like a valve protected the walls from the intestinal contents. Bidder recommended this method, which has latterly been followed by Krönlein, and which is termed by French surgeons "dédoublement" of the fistula-edges, in the treatment of fistulæ implicating the small intestine and the vagina.

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